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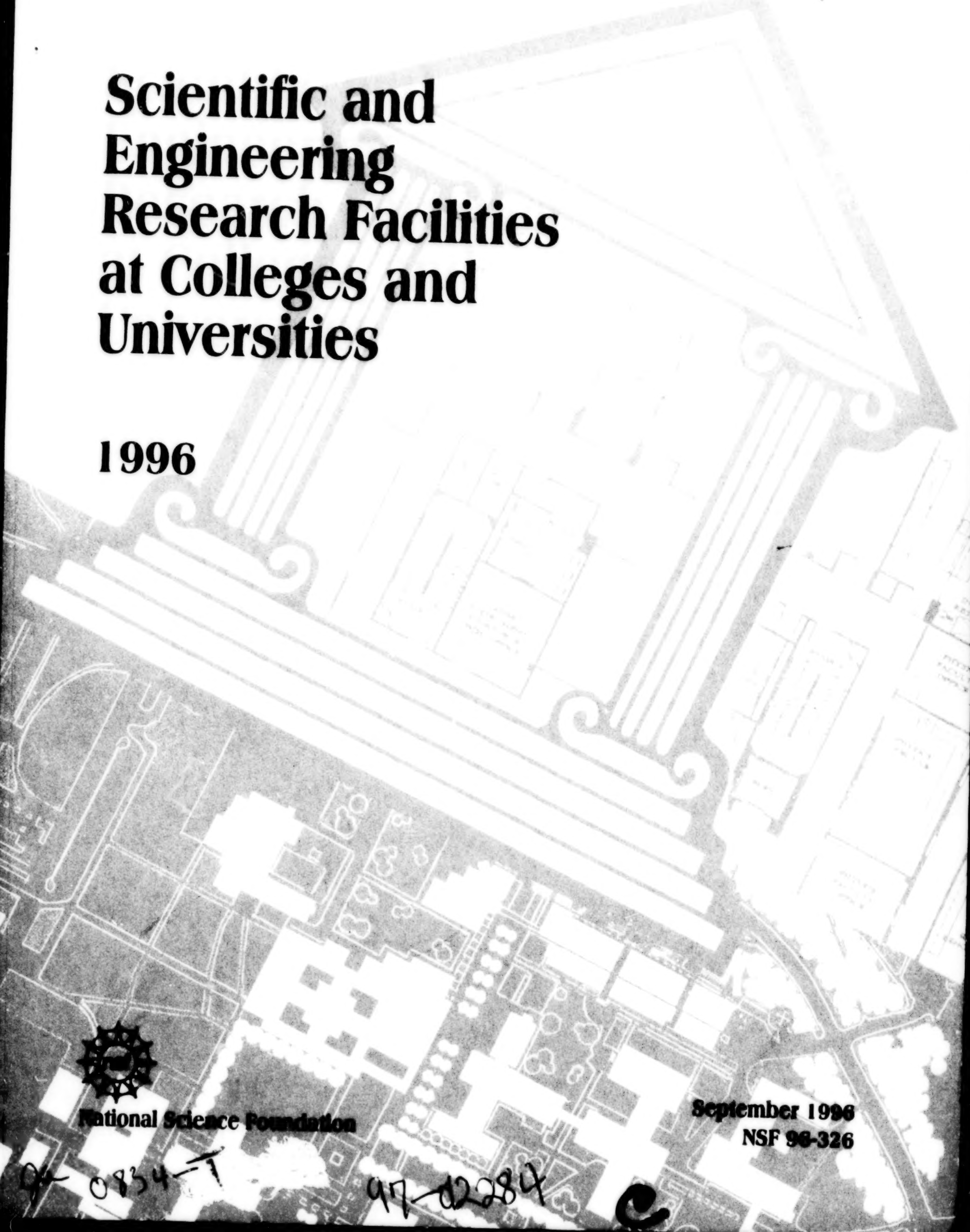
Scientific and Engineering Research Facilities at Colleges and Universities

1996



National Science Foundation

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Highlights . . .

- In 1996, science and engineering (S&E) research accounted for 136 million net assignable square feet (NASF) in the nation's 565 research-performing colleges and universities. The top 100 universities in research and development (R&D) expenditures accounted for 72 percent of all S&E research space in 1996, and 80 percent of all R&D dollars in 1994, the most recent year for which data were available.
- S&E research space increased since 1988 at an annual average rate of about 2.4 percent, from 112 million NASF to 136 million NASF in 1996. Other National Science Foundation (NSF) surveys show that academic R&D spending grew in constant 1995 dollars at an average annual rate of approximately 4 percent from 1988 to 1994, the most recent year for which data are available.
- At least half of research performing institutions reported inadequate amounts of research space in the biological sciences outside of medical schools, the physical sciences, engineering, the agricultural sciences, and the medical sciences, both within and outside medical schools.
- In 1996, 18 percent of the S&E research space at research-performing institutions was rated as needing major renovation or replacement. Altogether, 24.5 million NASF of S&E research space required major renovation or replacement.
- In fiscal years 1994-1995, research-performing colleges and universities began S&E research construction projects costing $2.8 billion, representing a continued decline in the construction of S&E research space. Institutions began construction projects valued at $3.0 billion (in constant 1995 dollars) in 1992-1993, and $3.4 billion in 1990-1991.
- Expenditures for repair/renovation projects increased from $905 million in fiscal years 1992-1993 to $1.1 billion in 1994-1995, an increase of 17 percent in constant 1995 dollars.
- The main source of construction funding was state and local governments ($1.2 billion, or 43 percent of all construction funding). Direct Federal funding for construction declined in constant 1995 dollars from $537 million in 1990-1991 to $207 million in 1994-1995. Funds from the Federal government used to defray the indirect costs of conducting Federally-funded research are counted as institutional funds.
- Repair/renovation projects were most likely to be funded through institutional funds ($433 million, or 41 percent of all repair/renovation). Federal funding of repair/renovation increased in constant 1995 dollars from $55 million in 1990-1991 to $111 million in 1994-1995.
- The total estimated cost for deferred S&E research construction and repair/renovation projects in 1996 was $9.3 billion, including both projects that were identified in approved institutional plans and those that were not. Over three-quarters of all deferred capital project expenditures ($7.4 billion) were included in institutional plans.
- In addition, colleges and universities estimated a total of $2.5 billion in deferred repair and renovation costs for projects affecting central campus infrastructure. It is estimated, conservatively, that $.7 billion of this amount might be attributed to S&E research needs. Combining this $.7 billion with the $9.3 billion in deferred construction and repair/renovation projects yields a total of $10 billion in deferred research facilities and infrastructure needs.

Scientific and Engineering Research Facilities at Colleges and Universities

1996

Project Director: Ann T. Lanier

National Science Foundation

September 1996
NSF 96-326

C-2

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Foreword

In the last 50 years, America has relied increasingly on the scientific and technological knowledge generated at its colleges and universities. We have come to expect that the highly trained scientists and engineers in academia would generate new knowledge and make possible innovations and new developments for our national security and our general prosperity. We have been confident that a strong national investment in our academic research and education enterprise would reward us multifold. That confidence has been justified by unforeseen benefits and a continuous stream of new knowledge and research.

A critical ingredient in these research achievements has been state-of-the-art facilities and infrastructure. From 1960 to the early 1980s, we as a nation paid careful attention to updating and expanding this backbone of the research enterprise. By the mid 1980s, however, concern spread about the rising neglect and obsolescence of our once highly acclaimed science and engineering infrastructure. Many speculated that this deterioration would limit the quality and quantity of our research in the future.

At this juncture, the Congress in Section 108 of the National Science Foundation Authorization Act for Fiscal Year 1986 (42 U.S.C. 1886) directed the National Science Foundation to collect data that would provide an accurate and comprehensive picture of research facility conditions and needs at our colleges and universities. A pilot study published in 1986 provided the initial background for a more comprehensive report.

In accord with the Congressional mandate, we have conducted biennial surveys of our research facilities. This report presents the findings of the sixth biennial survey. It includes a broad quantitative depiction of existing research facilities, current construction and renovation initiatives, funding sources, plans for future projects, and identification of deferred projects.

The information contained in this survey was not intended to answer the policy questions related to the nation's research infrastructure problems. Despite that, it can provide accurate and useful information for such a policy dialogue among all the proponents of a healthy and productive science and engineering research enterprise for the nation.

Neal Lane

Neal Lane
Director
National Science Foundation

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Acknowledgments

The 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities was developed and guided by Ann T. Lanier, Senior Science Resources Analyst, Education and Human Resources Program (EDU), Division of Science Resources Studies (SRS), National Science Foundation (NSF), under the direction of Mary J. Golladay, EDU Program Director. Guidance and review were provided by Kenneth M. Brown, Director, SRS, Al Tupek, Acting Director of SRS, and Cora B. Marrett, Assistant Director for Social, Behavioral, and Economic Sciences (SBE), NSF. Review and comments were provided by Carolyn B. Arena, Project Director for the Academic Instrumentation Survey, SRS, and Nathaniel G. Pitts, Director, Office of Science and Technology Infrastructure, NSF.

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An Expert Advisory Panel contributed to the survey design, the analysis plan, and the review of this report. Members included the following:

- James E. Swartz, Professor of Chemistry, Grinnell College
- Jacqueline Wender, Associate Provost for Facilities Planning, Stanford University
- Karen Yarbrough, Vice President for Research and Planning, The University of Southern Mississippi
- Bruce Gillars, Facilities Coordinator, University of Utah
- Robert McGhee, Director of Research Facility Planning, Howard Hughes Institute
- William R. Tibbs, Jr., Principal, Tibbs Associates
- Earl S. Richardson, President, Morgan State University
- Jaleh Daie, Senior Science Advisor for Academic Affairs, University of Wisconsin Madison

In addition, NSF sought advice on the development of the survey from higher education association and university representatives, who graciously provided information of considerable importance to the success of the project.

Administrators at the higher education associations and societies who reviewed and commented on the report included:

- Marvin E. Ebel, Council on Governmental Relations (COGR)
- Howard Gobstein, Federal Relations Office, Michigan State University
- Wayne Leroy, Association of Physical Plant Administrators of Universities and Colleges
- Jeanne Narum, Independent Colleges Offices (ICO)
- Jerold Roschwalb, National Association of State Universities and Land-Grant Colleges (NASULGC)
- John G. Stevens, Council on Undergraduate Research (CUR)

The 1996 survey was conducted by The Gallup Organization of Rockville, Maryland, under contract to NSF (Contract Number SRS-9317363). Gregory Gaertner served as Gallup's overall Project Director; Jennifer Spielvogel led field operations; Manas Chattopadhyay was the project statistician; and Yonghe Yang directed the data processing for the survey. Alison Cooper and Betty Garrison managed the production of the report.

Subcontractors for the project were Pelavin Research Institute (PRI) and the American Institutes for Research (AIR). Rita Kirshstein headed the Pelavin team, Susan Kleimann directed the AIR contributors, and Ray Varisco edited the report.

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Executive Summary

Overview

On a biennial basis since 1986, the National Science Foundation (NSF) has collected data on issues related to science and engineering (S&E) research facilities in our nation's colleges and universities. This effort stems from hearings held in the mid-1980s in both the U.S. House of Representatives and the Senate. Recognizing that the condition of S&E research facilities in higher education institutions posed a "serious and ongoing problem," Congress mandated that NSF gather data and report results to Congress:

> *The National Science Foundation is authorized to design, establish, and maintain a data collection and analysis capability in the Foundation for the purpose of identifying and assessing the research facilities needs of universities and colleges. The needs of universities by major field of science and engineering, for construction and modernization of research laboratories, including fixed equipment and major research equipment, shall be documented. University expenditures for the construction and modernization of research facilities, the sources of funds, and other appropriate data shall be collected and analyzed. The Foundation, in conjunction with other appropriate Federal agencies, shall report the results to Congress. The first report shall be submitted to Congress by September 1, 1986 (42 U.S.C. 1886).*

This executive summary presents the major findings from the 1996 survey and compares them with those from earlier efforts. A brief description of the study methods precedes a discussion of several issues that focus on the S&E research facilities in research-performing colleges and universities, including:

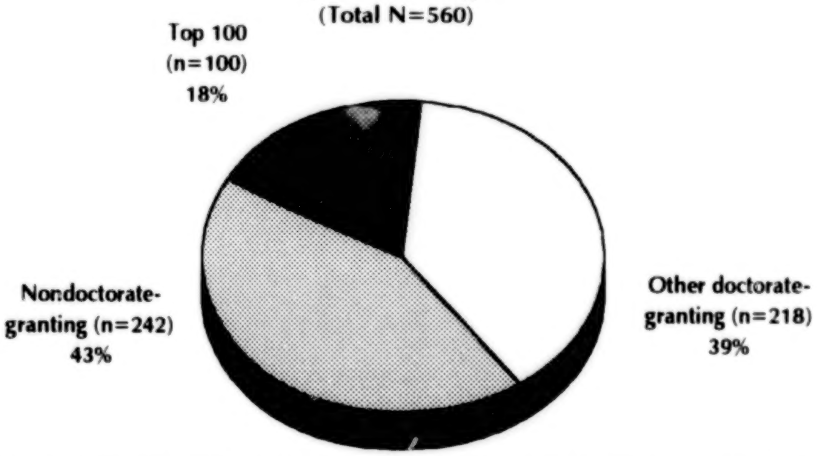
- The amount of space available for S&E research in our nation's colleges and universities;
- The adequacy of this space and its condition;
- The construction of S&E research space as well as the repair/renovation of existing space;
- The source of funding for repairs and construction; and
- The research facility needs of colleges and universities.

Profiles of Historically Black Colleges and Universities (HBCUs) and a select group of institutions that focus on undergraduate education follow the summary of the above issues. The last section of the report examines issues that relate to animal research facilities.

Survey Methods

The 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities was mailed to a sample of 314 institutions in the fall of 1995. That sample represented 560 colleges and universities with either research and development (R&D) expenditures of $50,000 or more in 1991, or HBCUs with any R&D expenditures in that year.[1] Of those 560 research-performing institutions, 242 (43 percent) were nondoctorate-granting, 100 (18 percent) were the institutions with the largest R&D expenditures (referred to throughout the report as the "top 100") and 218 (39 percent) were other doctorate-granting (Figure 1).

Figure 1. Number of Research-Performing Institutions by Institution Type
(Total N=560)



SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

The institutions sampled in 1996 were the same as those sampled in 1994, and those institutions that responded in 1994 were sent a computer-generated facsimile of their previous responses. All institutions were given the option to respond to the survey via computer disk, and 30 percent used this option. Extensive telephone follow-up resulted in a 97 percent response rate overall, with 100% participation from the top 100 and from Historically Black Colleges and Universities (HBCUs). Telephone contacts were also used to resolve incomplete and inconsistent responses. (See Appendix A, "Technical Notes," for a detailed description of the sampling procedures and data-collection methods.)

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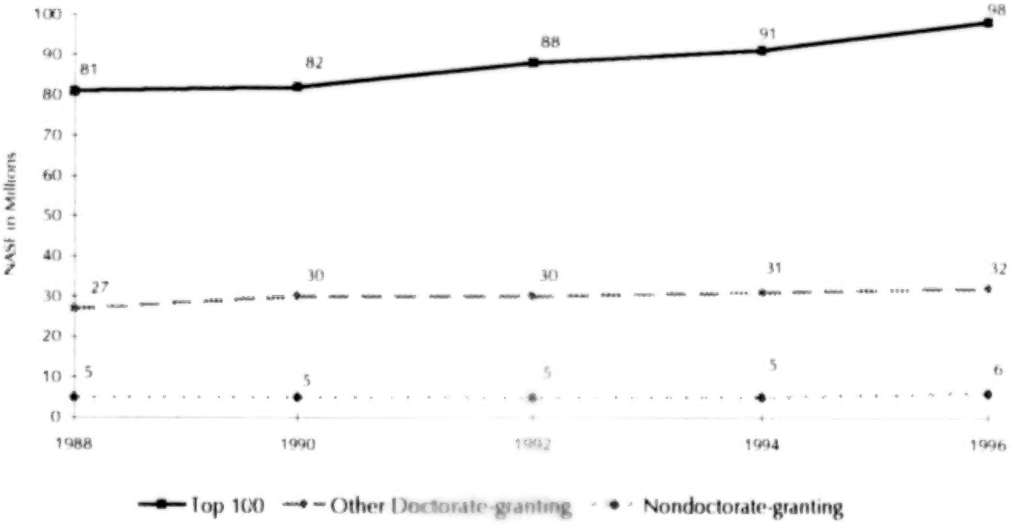
[1] Throughout this report, these 560 colleges and universities are referred to as "research-performing" institutions.

The Amount of S&E Research Space in Colleges and Universities

In 1996, S&E fields occupied about 285 million net assignable square feet (NASF) of space in research-performing colleges and universities, with 136 million NASF devoted to research.[2] The top 100 institutions occupied 72 percent of this S&E research space (about 98 million NASF). In 1994 (the most current year for which data were available), the top 100 universities accounted for 80 percent of all R&D expenditures.

The amount of S&E research space has increased steadily since 1988, from 112 million NASF in that year to 136 million NASF in 1996. Most growth occurred at the top 100 universities, where S&E research space grew 21 percent (from 81 million NASF in 1988 to 98 million NASF in 1996) (Figure 2).

Figure 2. Total Net Assignable Square Feet of S&E Research Space by Institution Type



SOURCE: National Science Foundation/SRS, 1996 *Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

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[2] In this report, research is defined as "...all research and development activities of an institution that are budgeted and accounted for." Research can be funded by the Federal government, state governments, foundations, corporations, and other sources. Research space refers to the net assignable square footage of space within research facilities (buildings) in which research activities take place. Multipurpose space, such as an office, is prorated to reflect the proportion of use devoted to research activity.

Ninety percent of all institutions had S&E research space in the biological sciences outside of medical schools and 88 percent had S&E research space in the physical sciences. Those fields occupied 19 million NASF of S&E research space and 18 million NASF, respectively. In 1996, engineering and agricultural sciences contained the most S&E research space; and each of those fields occupied 22 million NASF of space. However, only 51 percent of all research-performing institutions reported S&E research space in engineering, and only 20 percent reported space in the agricultural sciences.

The Adequacy of S&E Research Space

Institutions assessed the adequacy of S&E research space for each field, and at least half reported inadequate amounts in the biological sciences outside of medical schools, the physical sciences, engineering, the agricultural sciences, and the medical sciences, both within and outside medical schools.[3]

The Condition of S&E Research Space

In 1996, 37 percent of the S&E research space at research-performing institutions was rated as suitable for use in the most scientifically sophisticated research, 44 percent was considered effective for most levels of research, and the remaining 18 percent was thought to need major renovation or replacement. Altogether, 24.5 million NASF of S&E research space required major renovation or replacement.

Since 1988, the amount of research space requiring repair/renovation or replacement in many of the S&E fields has increased. In the agricultural sciences, the amount increased from 3.6 million NASF in 1988, to 5.3 million in 1996. The amount of S&E research space in the biological sciences outside of medical schools requiring repair/renovation or replacement increased from 2.4 million NASF in 1988, to 3.4 million in 1966. Engineering space in this condition grew from 2.2 million NASF to 4.0 million NASF.

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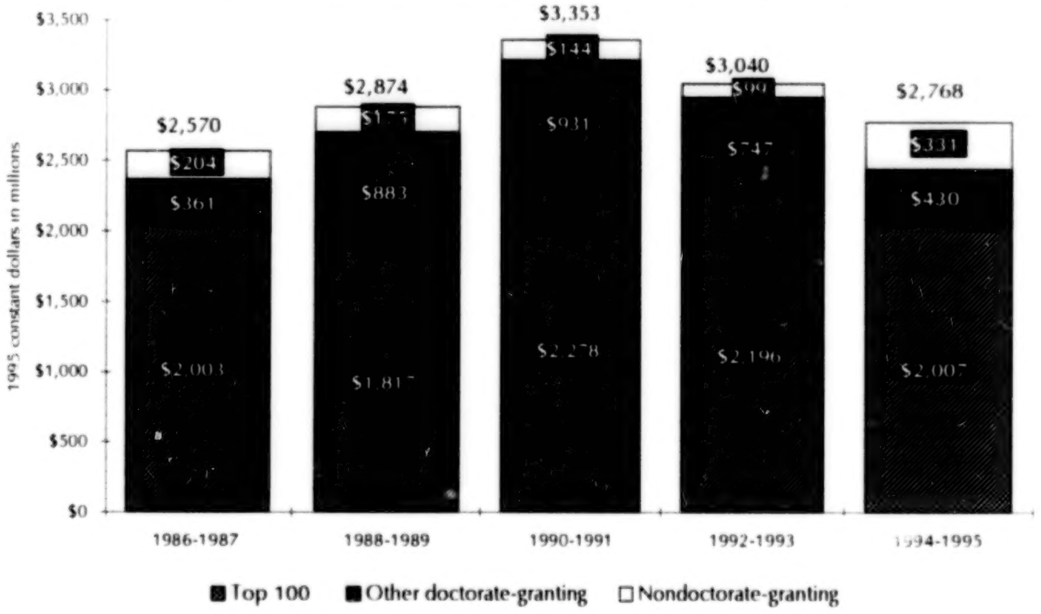
[3] Only those institutions that had existing S&E research space in a field reported whether or not the amount was adequate.

The Construction of S&E Research Space

In fiscal years 1994-1995, research-performing colleges and universities began S&E research construction projects costing $2.8 billion, representing a continued decline in the construction of S&E research space. In the 1992-1993 fiscal years, institutions began construction projects valued at $3.0 billion (in constant 1995 dollars)[4], and in the previous two fiscal years, S&E research construction projects cost $3.4 billion. This decline since the 1990-1991 fiscal years occurred in both the top 100 research performers and other doctorate-granting institutions. For nondoctorate-granting institutions, S&E research construction projects begun in the 1994-1995 fiscal years increased over the previous two fiscal years (Figure 3).

Figure 3. Trends in S&E Construction Expenditures, by Institution Type: 1986-1995



SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

More than one-half of the $2.8 billion in construction spending was accounted for by engineering ($575 million), the medical sciences in medical schools ($525 million), and the physical sciences ($426 million). Institutions spent the next largest amounts of money to construct research space in the biological sciences outside of medical schools ($388 million), the biological sciences in medical schools ($226 million), and the agricultural sciences ($150 million). The largest increase in spending for the construction of S&E research space between fiscal years 1992-1993 and 1994-1995 occurred in engineering (from $309 million to $575 million).

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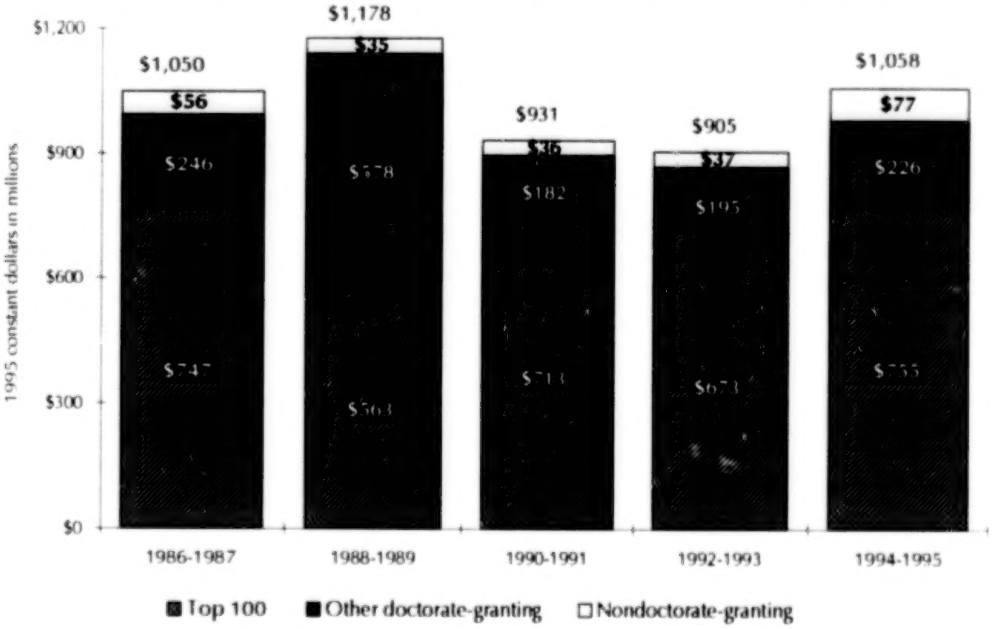
[4] All dollars reported have been adjusted to 1995 constant dollars, using the Bureau of the Census's Fixed-Weighted Price Index for Construction. See Table A-5 in Appendix A.

The Repair/Renovation of Existing S&E Research Space

Expenditures for repair/renovation projects costing over $100,000 increased between fiscal years 1992-1993 and 1994-1995. In fiscal years 1992-1993, all research-performing institutions spent a total of $905 million. In fiscal years 1994-1995, the same institutions spent $1.1 billion, an increase of 17 percent in constant dollars (Figure 4). Spending at doctorate-granting institutions increased from $868 million to $981 million. At nondoctorate-granting institutions, spending more than doubled, from $37 million to $77 million.

Figure 4. Trends in S&E Repair/Renovation Expenditures, by Institution Type: 1986-1995



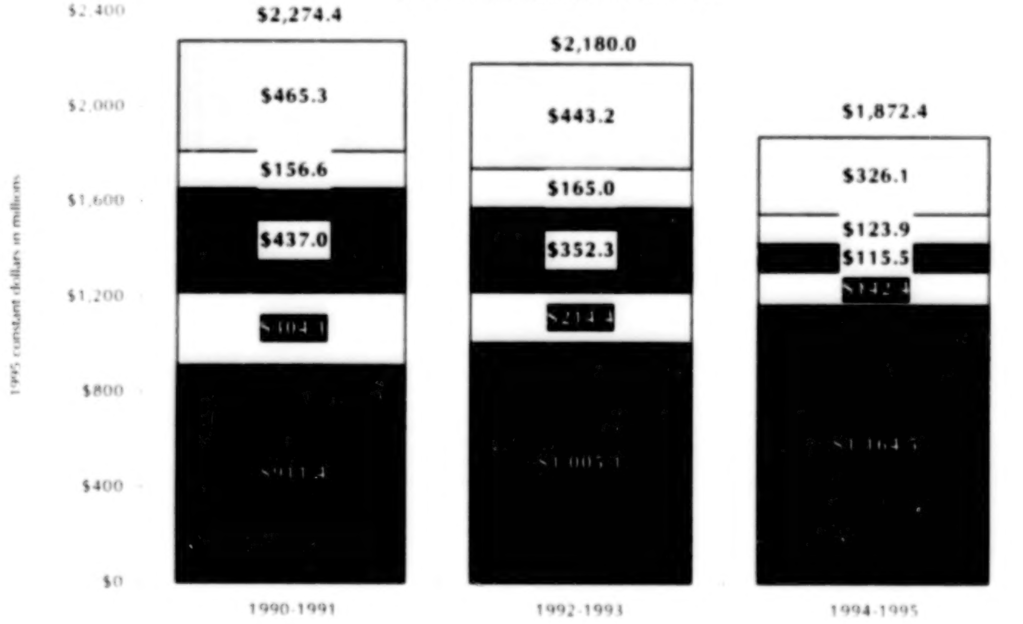
SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Institutions spent more to repair/renovate S&E research space in the medical sciences in medical schools ($226 million) than in any other field during fiscal years 1994-1995. Repair/renovation expenditures for biology and the medical sciences in medical schools represented approximately 31 percent of all repair/renovation expenditures in fiscal years 1994-1995. Repair/renovation expenditures for those fields, however, were lower in both constant dollar terms and as a proportion of total repair/renovation spending in fiscal years 1994-1995 than in fiscal years 1992-1993.

The Funding of Research Facilities Projects

Public and private research-performing institutions fund the construction of S&E research facilities differently. For all three types of public institutions--the top 100, other doctorate-granting, and nondoctorate-granting--state and local governments provided the major funding for constructing research facilities in fiscal years 1994-1995 (Figure 5).

Figure 5. Trends in the Sources of Funding for S&E Research Construction Projects at Public Institutions: 1990-1995

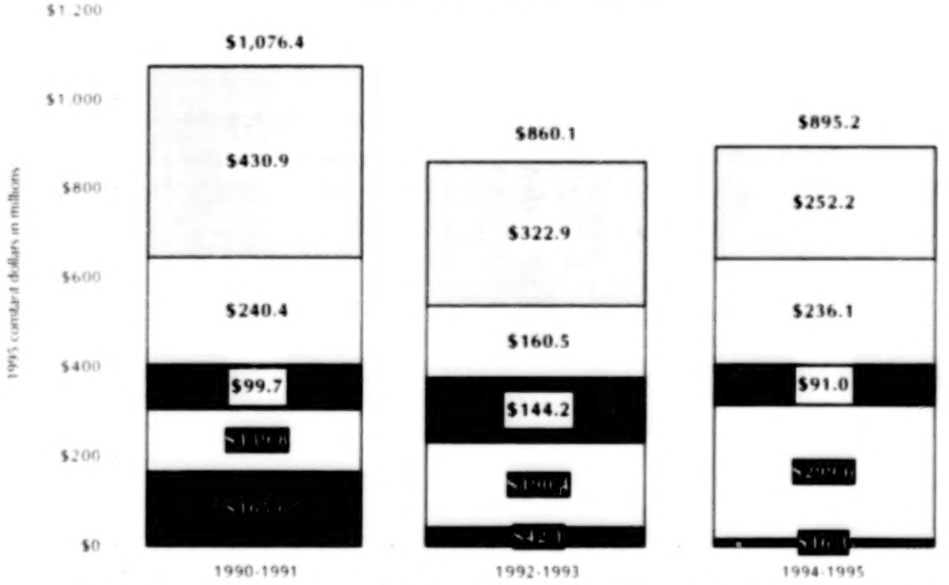


SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities

Public universities in the top 100 received half of their construction funding from state and local governments; public, other doctorate-granting institutions received 75 percent from this source; and the public, nondoctorate-granting institutions received virtually all (99 percent) of their construction funds from state and local governments.

Private colleges and universities received very little funding from state and local governments to construct S&E research facilities (Figure 6). For the 1994-1995 fiscal years, the single largest source of funding for the construction of S&E facilities at private universities in the top 100 was institutional funds, which provided 37 percent of all S&E construction funding. For private, other doctorate-granting institutions, 79 percent of all S&E construction funding came from private donations. Private sources also provided the largest share of funding to private, nondoctorate-granting institutions (44 percent).

Figure 6. Trends in the Sources of Funding for S&E Research Construction Projects at Private Institutions: 1990-1995



SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities

With the exception of the private universities in the top 100, direct Federal funding to construct S&E research facilities was lower at all types of institutions, in both constant dollar terms and in relative terms, in fiscal years 1994-1995 than in 1992-1993. Funds from the Federal government used to defray the indirect costs of conducting Federally funded research are counted as institutional funding.

State and local governments also were the single largest source of funding for the repair/renovation of S&E research space in all three types of public institutions. The private, doctorate-granting institutions, both in the top 100 and others relied primarily on institutional funds, while the nondoctorate-granting institutions relied most heavily on private donations.

Deferred Construction and Repair/Renovation

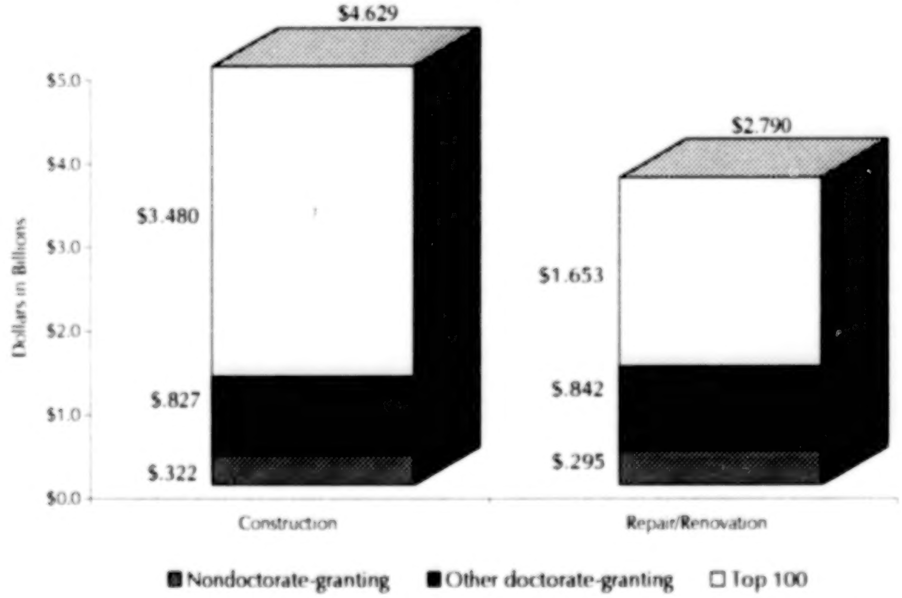
The 1996 *Survey of Scientific and Engineering Research Facilities at Colleges and Universities* expanded a question asked for the first time in 1994, in order to determine construction and repair/renovation costs that institutions had deferred. The earlier effort requested information only about deferred capital projects that were included in approved institutional plans. In 1996, institutions reported separately the construction and repair/renovation costs for projects included in such plans, as well as for projects not included. Thus, while response was limited in 1994 to colleges and universities with institutional plans identifying deferred projects, all institutions were allowed to respond in 1996.

The total estimated cost for deferred S&E research construction and repair/renovation projects in 1996 was $9.3 billion, including both projects that were in institutional plans and those that were not. Sixty-one percent of the deferred total ($5.7 billion) was intended for the construction of S&E research space. The top 100 universities accounted for 71 percent of the total deferred construction and repair/renovation costs.

In addition, colleges and universities estimated a total of $2.4 billion in deferred repair/renovation costs for projects affecting central campus infrastructure. Central campus infrastructure includes walkways and roads, wiring for telecommunications and electricity, sewers and drains, air handling, waste storage and disposal and the like. It is difficult to establish how much of this central campus infrastructure supports the work of S&E research compared with other academic or residential needs. Since 56 percent of all academic space is devoted to S&E, and 48 percent of that space is research space, a conservative estimate of S&E research needs for central campus infrastructure might be calculated as $.7 billion. It should be recognized that (1) S&E research is probably more demanding of central campus infrastructure than other space, and (2) it is more difficult to prorate infrastructure costs than research facilities costs. Thus, $.7 billion is a very conservative estimate of the S&E research infrastructure deferred project costs.

The 1994 report identified only projects which had been included in institutional plans, while the current report separately analyzes projects included and not included in institutional plans. Over three-quarters of all deferred capital project expenditures reported by institutions in the current survey (79 percent or $7.4 billion) were included in institutional plans. Figure 7 shows that of the $7.4 billion in deferred capital project expenditures in 1996, $4.6 billion were in construction costs, and $2.8 billion were in repair/renovation costs. Between fiscal years 1994 and 1996, deferred capital project costs included in institutional plans increased $1.2 billion, from $6.2 billion to $7.4 billion in constant dollars. The majority of this increase was in deferred repair/renovation costs (an increase of $970 million, compared with an increase of $259 million in deferred construction costs). The balance of the difference between the $7.4 billion included in institutional plans and the reported facilities needs of $9.3 billion is due to the inclusion of $1.9 billion in deferred projects not included in institutional plans. If combined with the conservative estimate of $.7 billion in deferred infrastructure costs that can be attributed to S&E research, the total deferred facilities and infrastructure needs of colleges total $10.0 billion.

Figure 7. Unfunded Science and Engineering (S&E) Research Facilities Needs Included in Institutional Plans: 1996



SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Historically Black Colleges and Universities

For over a century, Historically Black Colleges and Universities (HBCUs) have played an important role in the education of black students in the United States. Over 282,000 students attended the 107 colleges and universities considered to be HBCUs in the fall of 1993. Although many of the HBCUs are relatively small and have considerably less S&E research space than other research-performing institutions, they award a disproportionate number of bachelor's degrees in the sciences. In 1990, for example, HBCUs enrolled only 17 percent of all black college students, but they awarded 44 percent of all bachelor's degrees in the sciences that went to black students (*Academe*, January/February 1995).

In 1996, the 68 research-performing HBCUs contained 9 million NASF of S&E space, with 26 percent of that space used for research. This space was most likely to be found in the biological sciences outside of medical schools (97 percent of the HBCUs reported space in this field) and in the physical sciences (79 percent).

HBCUs were most likely to indicate that they needed additional S&E research space in the computer sciences (57 percent reported this to be the case). In 1996, at least half of the HBCUs reported an inadequate amount of S&E research space in engineering (56 percent) and in the biological sciences outside of medical schools (50 percent).

Fourteen percent of the S&E research space in HBCUs (336,000 NASF) was evaluated as requiring major renovation or replacement.

The amount spent to construct S&E research space at the research-performing HBCUs declined dramatically, from $30.2 million (in 1995 constant dollars) in 1992-1993, to $21.3 million in 1994-1995. Repair/renovation expenditures increased from $9.6 million in 1992-1993 to $22.0 million in 1994-1995.

HBCUs reported a total of $302 million in S&E capital projects that were needed but had to be deferred because there was not sufficient funding available. These included $196 million in projects to construct S&E research space and $106 million to repair/renovate existing S&E research space.

Nondoctorate-Granting Institutions

Many scientists and engineers receive training at research-performing institutions that do not award doctoral degrees. The visibility of these institutions has increased in recent years as policy makers recognize the contributions of these institutions to the production not only of practicing scientists and engineers, but of science and mathematics teachers for our nation's elementary and secondary schools.

In 1996, the nondoctorate-granting institutions contained 29 million NASF of S&E space. The comprehensive universities (those that offer a liberal arts program along with other programs such as engineering and business) accounted for 83 percent of the total S&E space among the nondoctorate-granting institutions.

In 1996, the biological sciences outside of medical schools and the physical sciences accounted for half of the S&E research space in the nondoctorate-granting institutions. In the liberal arts colleges, each of these fields occupied .5 million NASF. Together, the two fields accounted for 71 percent of the total 1.4 million NASF of S&E research space at those colleges.

Comprehensive universities evaluated 19 percent of their S&E research space (836,000 NASF) as needing major renovation or replacement. Liberal arts colleges reported 17 percent of their S&E research space (238,000 NASF) to be in the same condition.

To construct S&E research space, the nondoctorate-granting institutions spent $330.6 million in fiscal years 1994-1995. Comprehensive universities accounted for 89 percent ($294.5 million) of the S&E construction dollars among the nondoctorate-granting institutions. Another $76.8 million was spent to repair/renovate existing S&E research space, with comprehensive universities accounting for $51.1 million (66 percent) of total repair/renovation dollars.

Nondoctorate-granting institutions reported $772 million in capital projects that were needed but had to be deferred because sufficient funding was not available. Forty-seven percent of these costs were for construction projects, while the balance (53 percent) was for repair/renovation projects.

Animal Care Facilities

To ensure the safekeeping and proper use of animals in research, Congress has provided guidelines for their humane care. The 1996 facilities survey gathered information on the amount of animal research space, the extent to which it meets government regulations, and the amount of construction and repair/renovation activity undertaken.

In 1996, 88 percent of the research-performing institutions had laboratory animal facilities. Most of the 12.2 million NASF of animal research space (93 percent) was contained in the doctorate-granting universities. Two-thirds of the animal research space was used to house animals and one third was considered animal laboratory space.

Institutions with animal research space reported that about 10 million NASF of that space (82 percent) met government regulations in 1996. Another 1.2 million NASF (10 percent) needed limited repair/renovation to meet those regulations; and 1.1 million NASF (9 percent) needed major repair/renovation to meet regulation requirements.

Only 6 percent of the research-performing institutions with animal research facilities were scheduled to construct animal facilities in fiscal years 1996-1997. Thirteen percent were scheduled to repair/renovate such facilities. However, the construction costs were almost double the repair/renovation costs: $164.1 million to construct animal research space and $83.3 million to repair/renovate existing space.

Introduction

Background

Since 1986, the National Science Foundation (NSF) has collected data on issues related to science and engineering (S&E) research facilities in U.S. colleges and universities. Conducted biennially, the *Survey of Scientific and Engineering Research Facilities at Colleges and Universities* has provided information on the availability and condition of S&E research space, the extent to which colleges and universities construct facilities and repair existing space, the funding of this activity, and the need for additional S&E research space.

The impetus for this effort stems from hearings held in both the U.S. House of Representatives and the Senate in the mid-1980s. These hearings concluded that the condition of S&E research facilities in our nation's higher education institutions posed a "serious and ongoing problem." Very little data were available, however, to evaluate either the extent of the problem or the likelihood of the problem continuing.

Recognizing the need for information on the amount and quality of S&E research space, Congress mandated that NSF gather this information and report it to Congress:

> *The National Science Foundation is authorized to design, establish, and maintain a data collection and analysis capability in the Foundation for the purpose of identifying and assessing the research facilities needs of universities and colleges. The needs of universities by major field of science and engineering, for construction and modernization of research laboratories, including fixed equipment and major research equipment, shall be documented. University expenditures for the construction and modernization of research facilities, the sources of funds, and other appropriate data shall be collected and analyzed. The Foundation, in conjunction with other appropriate Federal agencies, shall report the results to the Congress. The first report shall be submitted to the Congress by September 1, 1986 (42 U.S.C. 1886).*

NSF submitted a report to Congress in 1986, and additional reports were submitted in 1988, 1990, 1992, and 1994. In each of those years, surveys were conducted to provide NSF with the information Congress requested. This 1996 report summarizes the findings of the 1996 survey, and it compares results with previous years.

The Survey and Its Design

The 1996 *Survey of Scientific and Engineering Research Facilities at Colleges and Universities* collected data to address a number of questions regarding S&E research space, including the following:

- How much S&E research space is available in our nation's colleges and universities?
- Is the current amount of S&E research space sufficient?
- What is the condition of existing S&E research space?
- To what extent are colleges and universities constructing S&E research space?
- To what extent are colleges and universities repairing and renovating their current S&E research space?
- Who is funding the construction and repair of S&E research space?
- What is the need for additional S&E research space as well as the need to repair or renovate current space?

Since the survey was initiated in 1986, attention has focused on providing Congress with trends on S&E research facilities issues. Slight changes have been made to the survey, however, in each of the data collection cycles. In 1996, the survey added questions to determine the extent to which colleges and universities needed more S&E research space and were renovating or replacing existing space. Questions also were added to determine the central campus infrastructure needs of colleges and universities.

In addition, the 1996 survey modified both the wording of some questions and the possible responses. Changes made were in response to new concerns of NSF and Congress, as well as concerns of institutional respondents and advisory panel members representing the higher education community. (Specific changes are noted at the beginning of each chapter in the section, "Data Considerations.")

The sample for the 1996 survey was designed to provide efficient and unbiased estimates of the amount of S&E research space in colleges and universities and to retain comparability with the 1992 and 1994 sampling procedures. The 1996 sample, like the 1994 sample, represented all institutions with more than $50,000 in research and development (R&D) expenditures as well as Historically Black Colleges and Universities (HBCUs) with any R&D expenditures. The 1996 sample represented 560 such institutions, referred to as research-performing institutions throughout this report.

Most sampled institutions were selected with a probability proportional to the square root of their R&D expenditures in thousands. (See Appendix A, "Technical Notes," for a more complete discussion of sampling procedures.) The final sample of 314 colleges and universities, which represented the universe of 560 research-performing institutions, included the following:

- All of the top 100 colleges and universities in terms of R&D expenditures (n=100);
- Other public, doctorate-granting universities (n=53);
- Other private, doctorate-granting universities (n=35);
- Public, nondoctorate-granting institutions (n=69); and
- Private, nondoctorate-granting institutions (n=50).

The HBCUs were included in the above categories.

The 1996 survey was mailed to all sampled institutions in the fall of 1995. For the first time, both a paper copy and a Windows-based disk version of the survey were included in the mailing. Respondents could thus record answers in either format.

Institutions that participated in the 1994 survey also were sent a computer-generated "facsimile" of their previous responses. Extensive telephone follow-up elicited a high response rate and reduced the number of items that respondents had initially omitted or responded to inconsistently. In all, 97 percent of all sampled institutions completed the survey. Of those, 27 percent chose to use the diskette and 73 percent filled out the paper version of the survey.

The Report

The 1996 report follows the basic format of the 1994 report, and each chapter contains the following sections:

- ***Highlights***--a summary of key findings;
- ***Background***--the rationale and context for the findings presented in the chapter;
- ***The Survey Question(s)***--a description of the question or questions that the chapter focuses on;
- ***Data Considerations***--a presentation of data limitations or interpretations; and

- ***Findings***--tables, graphs, and texts that address questions frequently posed about S&E research facilities.

Most chapters present differences by type of institution and S&E field. The categories used to define type of institution are:

- Doctorate-granting, which includes
    - ⇒ The top 100 institutions in R&D expenditures
    - ⇒ The other doctorate-granting institutions not in the top 100
- Nondoctorate-granting

For this survey and report, the following S&E fields are included:

- Biological sciences outside of medical schools
- Physical sciences
- Psychology
- Social sciences
- Mathematics
- Computer science
- Earth, atmospheric, and ocean sciences (formerly environmental sciences)
- Engineering
- Agricultural sciences
- Medical sciences, outside of medical schools
- Biological sciences, in medical schools
- Medical sciences, in medical schools

In addition, a chapter on HBCUs and a chapter on nondoctorate-granting colleges and universities profile S&E research facilities issues in these institutions. Expanding an effort made for the first time in 1994, the 1996 report also includes an expanded chapter on research facilities needs of colleges and universities. Finally, a chapter on animal care facilities is presented.

Chapter 1 presents findings on the amount of research space in S&E fields at research-performing institutions. Chapter 2 examines assessments of the adequacy of the amount of S&E research space, as well as its condition. Chapter 3 provides costs in constant dollars on the construction of S&E research facilities. Similarly, Chapter 4 provides costs in constant dollars for the repair/renovation of S&E research space. Chapter 5 examines the sources of funds for the capital projects described in Chapters 3 and 4.

Chapter 6 examines the needs of institutions for additional S&E research space, as well as the need for repair/renovation of existing space. Chapter 7 profiles S&E research space at HBCUs, and Chapter 8 profiles nondoctorate-granting institutions. The final chapter, Chapter 9, presents data on animal care facilities.

The 1996 report also contains five appendices:

- Appendix A, "Technical Notes," presents additional details about the study design and methodology;
- Appendix B, "List of Sampled Institutions," provides the names of all colleges and universities in the sample;
- Appendix C, "Questionnaire," provides the paper copy of the 1996 instrument;
- Appendix D, "Reference List," contains the full citation for all references used in this report;
- Appendix E, "Validation of Estimates of Deferred Project Costs," tests an alternative method for estimating deferred project costs; and
- Appendix F, "Detailed Statistical Tables," presents additional tables not included in the chapters.

Taken as a whole, the information prepared for this report will shed light upon building and maintaining research space in science and engineering at colleges and universities.

Chapter 1

Amount and Distribution of Research Space

Highlights . . .

- In 1996, the science and engineering (S&E) fields occupied 285 million net assignable square feet (NASF) in the nation's research-performing colleges and universities. Forty-eight percent, or 136 million NASF, was devoted to research.
- The top 100 universities in research and development (R&D) expenditures accounted for 72 percent of all S&E research space in 1996, and 80 percent of all R&D dollars in 1994 (the most recent year for which data were available).
- From 1988 to 1996, the amount of S&E research space increased from 112 million to 136 million NASF, an annual increase of 2.4%.
- In 1996, 90 percent of all research-performing institutions had S&E research space in the biological sciences outside of medical schools, and 88 percent had S&E research space in the physical sciences. Only 20 percent of all institutions had S&E research space in agriculture.

1

Background

How much space do scientists and engineers have in which to conduct research? This chapter compares the amount of S&E research space available in different types of colleges and universities and in different S&E fields. In addition, changes in the amount of S&E research space available since 1988 are examined.

The Survey Questions

Information reported in Items 1a and 1b of the survey (see Appendix C) is contained in this chapter.

Item 1a collects data on space for each of the S&E fields in units of net assignable square feet (NASF). NASF was defined as the sum of all areas (in square feet) on all floors assignable to, or available to be assigned to, an occupant for specific use, such as instruction or research. Two categories of research space included:

- ***Instructional and Research NASF.*** This includes all space used for academic purposes; it includes space that is used for instruction and space that is used for research.
- ***Research NASF.*** This is space that is used only for research; it does not include space that is used for instruction.

Item 1a also asks for the total instruction and research space for all non-science fields. Hence, the combined instruction and research space for both the S&E fields and non-science fields results in an estimate of total academic space. For S&E fields only, Item 1b requests the amount of research NASF that is leased.

Data Considerations

Respondents are asked to consider several issues in determining the amount of space their college or university devotes to S&E research:

- ***Space may be used for more than one purpose or be shared by more than one field.*** Examples include a laboratory that is used for research only part of the time or a building that is shared by two or more fields. For multi-purpose or shared space, the survey asks respondents to prorate the space. For instance, if a laboratory is used for research 30 percent of the time, respondents should count 30 percent of the laboratory's NASF as research space. If mathematics and computer sciences use the same laboratory, the space reported for each field should reflect the amount prorated by the amount of time that field uses the space.

- ***Some fields require more research space than others.*** Agricultural research requires considerably more space than mathematics research. Thus, a larger amount of research space in a field does not necessarily mean that that space is sufficient for conducting research.
- ***Beginning this year (1996), respondents may include non-fixed equipment costing $1 million or more.*** This does not appear to have affected the results, suggesting that respondents included this equipment in past surveys.
- ***Some space reported as under construction may be included in current space estimates.*** Research space under construction during the 1994 or 1995 fiscal years (see Item 4a) might be included in estimates of existing research space if that space was completed and occupied before the fall of 1995, the time the survey was administered.

Findings

How Much Space Was Available for S&E?

In 1996, the nation's 560 research-performing academic institutions had a total of 511 million NASF of academic space in all fields (Table 1-1). S&E fields occupied 56 percent of that space (285 million NASF).

The top 100 institutions in research expenditures contained as much academic space as all other types of research-performing colleges and universities combined. Although the top 100 institutions made up 18 percent of the 560 research-performing colleges and universities, they accounted for 50 percent of the space in all academic fields (255 million NASF).

The ratio of S&E space to total academic space varied by type of institution. The top 100 universities devoted 68 percent of all academic space to S&E. Conversely, nondoctorate-granting institutions used the least amount (37 percent) of their academic space for S&E purposes (Table 1-2 and Figure 1-1).

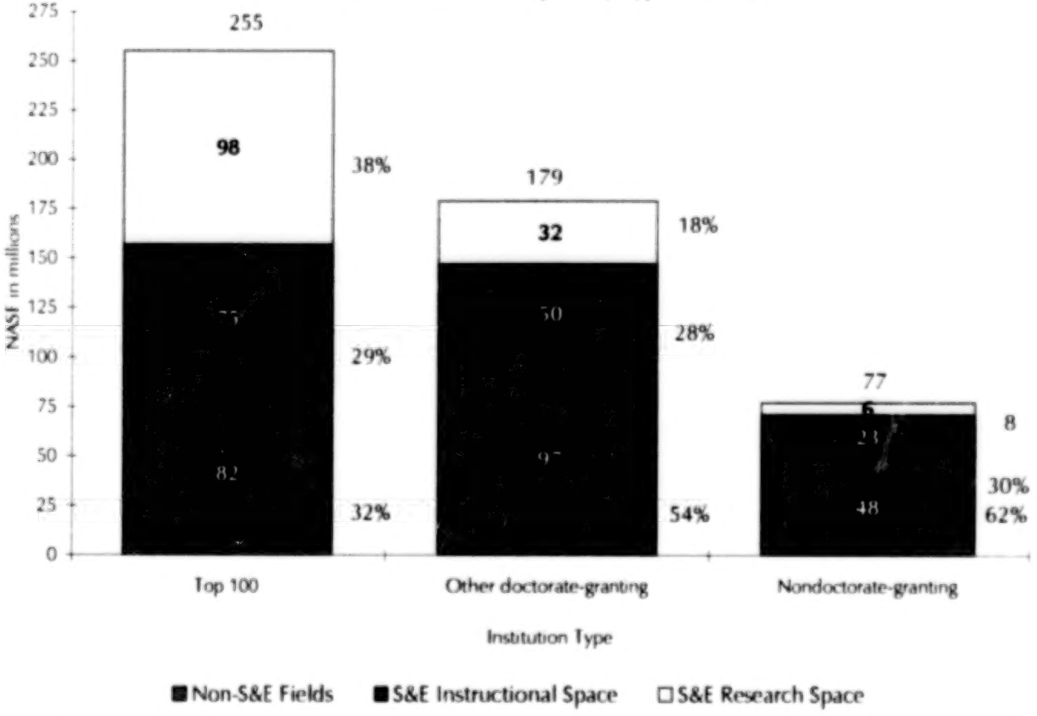
Table 1-1. Amount of science and engineering (S&E) research space by institution type: 1996

Institution type	*Number of institutions*	*Space in all academic fields*[1]	*Space in S&E fields*	*Research space in S&E fields*
		Net assignable square feet in millions		
Total	560	511	285	136
Doctorate-granting:				
Top 100 in research expenditures	100	255	173	98
Other	218	179	82	32
Nondoctorate-granting	242	77	29	6

[1] Projected from responses of 88 percent of participating institutions.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Figure 1-1.
Allocation of Total Academic Space by Type of Institution



SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

How Much S&E Space Was Used for Research?

In 1996, the total space devoted to S&E fields, including both instruction and research, comprised 56 percent of the total academic space at the nation's research-performing institutions (Table 1-2).

Almost half, 48 percent (136 million NASF), of all space in the S&E fields was devoted to S&E research. In the top 100 universities, S&E research space occupied 57 percent of all space in the S&E fields, while in the nondoctorate-granting institutions, research space occupied only 21 percent of the total S&E space.

The distribution of S&E research space in research-performing colleges and universities is roughly proportional to the distribution of research and development (R&D) expenditures. In 1994, the most recent year for which data are available, the top 100 universities accounted for 80 percent of all R&D expenditures, with the same institutions accounting for 72 percent (98 NASF divided by 136 NASF) of the total S&E research space in 1996 (Table 1-1).[1]

Table 1-2. Science and engineering (S&E) research space utilization: 1996

Institution type	*S&E space*	*Research space*	
	As a percentage of total academic space	*As a percentage of total S&E space*	*As a percentage of total academic space*
Total	56%	48%	27%
Doctorate-granting:			
Top 100 in research expenditures	68	57	39
Other	46	39	18
Nondoctorate-granting	37	21	7

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities*.

Has the Amount of S&E Research Space Increased?

Over the last eight years, the amount of S&E research space has increased steadily, from 112 million NASF in 1988 to 136 million NASF in 1996 (Table 1-3). This change reflects an increase of approximately 21 percent.

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[1] The R&D data are taken from the National Science Foundation, *Survey of Scientific and Engineering Expenditures at Universities and Colleges, FY 1994*.

Most increases resulted from steady growth at the top 100 institutions, wherein S&E research space grew 21 percent--from 81 million NASF in 1988, to 98 million in 1996. Research space at other institutions increased as well, although rate of growth was lower. At other doctorate-granting institutions, research space increased 18 percent, from 27 million NASF in 1988, to 32 million in 1996. After remaining steady at 5 million NASF since 1988, nondoctorate-granting institutions increased their research space to 6 million in 1996.

Table 1-3. Trends in the amount of science and engineering (S&E) research space by institution type: 1988-1996
[Net assignable square feet in millions]

Institution type	*1988*	*1990*	*1992*	*1994*	*1996*
Total	112	116	122	127	136
Doctorate-granting	107	111	117	122	131
Top 100 in research expenditures	81	82	88	91	98
Other	27	30	30	31	32
Nondoctorate-granting	5	5	5	5	6

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

How Much S&E Space Was Leased?

In 1996, research-performing colleges and universities leased 5.5 million NASF, or 4 percent of their total S&E research space (Table 1-4). This 5.5 million represents the largest amount of leased S&E research space since NSF began collecting data on S&E research facilities. The top 100 institutions leased the highest percentage of their space: 4.6 percent (4.5 million NASF). Nondoctorate-granting institutions leased less than 1 percent of their total S&E research space (16,600 NASF).

The amount of S&E research space that research-performing institutions lease has fluctuated somewhat since 1988, with the amount of leased S&E research space increasing from 4.4 million NASF to 5.5 million between 1994 and 1996. Most of this increase results from additional leased space among the top 100 universities.

Table 1-4. Trends in the amount of leased science and engineering (S&E) research space by institution type: 1988-1996
[Net assignable square feet in millions]

Institution type	*1988*	*1990*	*1992*	*1994*	*1996*
Total	3.8	3.6	4.8	4.4	5.5
Doctorate-granting	3.7	3.5	4.7	4.3	5.4
Top 100 in research expenditures	2.8	2.6	3.5	3.7	4.5
Other	0.9	0.9	1.2	0.6	0.9
Nondoctorate-granting	0.1	0.1	0.1	0.1	0.1

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

How Was Research Space Distributed Across S&E Fields?

In 1996, nearly all institutions had research space in the biological sciences outside of medical schools (90 percent) and in the physical sciences (88 percent) (Table 1-5). Psychology and the social sciences followed (77 percent of all research-performing institutions had research space in psychology and 68 percent had research space in the social sciences).

Research space in five more fields was reported in over half of all research-performing institutions: mathematics, 61 percent; the computer sciences, 61 percent; the earth, atmospheric, and ocean sciences, 55 percent; and engineering, 51 percent. In contrast, only 20 percent of all research-performing institutions had S&E research space in the agricultural sciences. However, the total amount of research space in the agricultural sciences (22 million NASF) was greater than that in the biological sciences outside of medical schools (19 million NASF) or the physical sciences (18 million NASF). Several of the fields grouped as "agricultural sciences"--animal sciences, plant sciences, soil sciences, forestry, and wildlife management, to name a few--require large amounts of research space.

Over a fifth (21 percent) of all research-performing institutions reported S&E research space in medical schools, both in the biological and medical sciences. At the top 100 institutions, 64 percent reported research space in the medical sciences in medical schools, and 58 percent reported research space in the biological sciences in medical schools.

Table 1-5. Percentage of institutions with science and engineering (S&E) research space by institution type and field: 1996

Field	***Total***	***Institution type***		
		Doctorate-granting		*Nondoctorate-granting*
		Top 100 in research expenditures	*Other*	
Biological sciences--outside medical school	90%	94%	85%	92%
Physical sciences	88	90	83	90
Psychology	77	86	78	71
Social sciences	68	89	63	63
Mathematics	61	83	64	50
Computer sciences	61	77	61	54
Earth, atmospheric, and ocean sciences	55	85	57	40
Engineering	51	86	56	33
Agricultural sciences	20	42	11	19
Medical sciences--outside medical school	42	77	46	26
Medical sciences--medical school	21	64	25	0
Biological sciences--medical school	21	58	27	0

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Between 1994 and 1996, no single S&E field experienced a large increase in the amount of research space (Table 1-6). Research space for the agricultural sciences increased from 20 million NASF in 1994, to 22 million in 1996. Biological research space outside of medical schools also increased by 2 million NASF during that same period (from 17 to 19 million NASF). Engineering research space, which demonstrated the most growth between 1988 and 1994 (from 16 million NASF to 21 million), continued to grow in 1996, to 22 million NASF. Medical science research space, both within medical schools and outside, grew by 1 million NASF, each.

Table 1-6. Trends in the amount of science and engineering (S&E) research space by field: 1988-1996

Field	*Net assignable square feet (in millions)*				
	1988	*1990*	*1992*	*1994*	*1996*
Total	112	116	122	127	136
Biological sciences--outside medical school	16	18	17	17	19
Physical sciences	16	16	16	17	18
Psychology	3	3	3	3	3
Social sciences	3	3	3	3	4
Mathematics	1	1	1	1	1
Computer sciences	1	1	2	2	2
Earth, atmospheric, and ocean sciences	6	6	7	7	7
Engineering	16	17	18	21	22
Agricultural sciences	18	21	20	20	22
Medical sciences--outside medical school	5	5	6	6	7
Medical sciences--medical school	14	15	16	17	18
Biological sciences--medical school	8	9	11	11	11
Other	4	2	2	2	2

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

The distribution of research space across the S&E fields approximated the distribution of R&D expenditures across the same fields. Engineering, for one, accounted for 16 percent of the S&E research space in 1996, as well as for 15 percent of 1994 R&D expenditures.[2] Mathematics and the computer sciences occupied 3 percent of the S&E research space and accounted for 4 percent of the R&D expenditures (Table 1-7).

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[2] The 1996 expenditure data were not available at the time this report was written. The most recent expenditure data, 1994, were therefore used.

Table 1-7: Comparison of the distribution of 1994 research and development (R&D) expenditures and 1996 science and engineering (S&E) research space by field

Field	1994 R&D Expenditures[1]		1996 S&E Research Space	
	Dollars (in millions)	Distribution (%)	NASF (in millions)	Distribution (%)
Total	$7,639	100%	136	100%
Engineering	1,147	15	22	16
Physical sciences	921	12	18	13
Environmental sciences	694	9	7	5
Mathematics/computer sciences	296	4	3	3
Life Sciences	4,043	53	77	56
Psychology	163	2	3	2
Social sciences	253	3	4	3
Other	112	1	2	1

NOTE: Percentages may not total to 100 due to rounding.

[1] *NSF Survey of Scientific & Engineering Expenditures at Universities & Colleges, FY 1994.*

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Chapter 2

Adequacy and Condition of Research Space

Highlights . . .

- Fifty percent or more of all research-performing institutions indicated inadequate amounts of science and engineering (S&E) research space in the biological sciences outside of medical schools, the physical sciences, engineering, agriculture, the medical sciences outside of medical schools, and the medical sciences in medical schools.
- Eighteen percent of all S&E research space was considered to require major renovation or replacement. This portion of space amounts to 24.5 million net assignable square feet (NASF).
- Since 1988, the agricultural sciences has been the field with the greatest amount of S&E space needing repair/renovation or replacement. In 1996, 5.3 million NASF of agriculture research space were reported as needing repair/renovation or replacement, an increase from 3.6 million NASF in 1988.

Background

Information focused solely on the amount of S&E research space and its growth or decline over time is insufficient for understanding whether there is enough space to conduct any form of research, and whether the condition of that space is suitable for conducting particularly sophisticated research. Assessments of both the quantity and quality of existing research space made by respondents at each institution in 1996, and over time, are examined below.

The Survey Questions

Respondents were asked to rate the adequacy of the amount of research space in each field at their institution by choosing one of the following (see Item 2 of the survey in Appendix C):

A	Adequate amount of space: sufficient to support all current S&E research program commitments in the field;
B	Inadequate amount of space: not sufficient to support the needs of your current S&E research program commitments in the field; or non-existent, but needed; or
NA	Not applicable or no space needed in this field.

For each field, respondents indicated the condition of research space by reporting the percentage of space falling into one of the following categories (see Item 3 of the survey in Appendix C):

A	Suitable for use in the most scientifically competitive research in the field;
B	Effective for most levels of research in the field, but may need limited repair/renovation;
C	Requires major renovation or replacement to be used effectively (includes categories D and E from 1994 survey); or
NA	Not applicable or no research space in this field.

To determine the overall amount and percentage of space that was rated in each of the above-listed categories, the amount of research space in each field (reported in Item 1a) was multiplied by the percentage of space reported in each of the above categories and totaled across fields. If a university had 1,000 net assignable square feet (NASF) of research space in physical sciences and 30 percent of that space "requires major repair," 300 NASF (1000 *.30) were considered to require major repair. These calculations were performed for each field for each institution, and they were summed to provide the total amount of space in each category.

Data Considerations

The survey measures both the adequacy of the amount of S&E research space and the condition of this space in each S&E field. Responses are based upon the assessments of a variety of different individuals, including the survey coordinator at the institution, as well as deans and other administrators. It must be noted that the two questions designed to gather information about the adequacy of the amount of research space and its condition elicit more subjective responses than do other survey items.

Furthermore, the wording and response choices of both of the above questions differ slightly from the version used two years earlier. In 1994, five categories were listed to elicit assessments of the amount of research space available, and five categories measured the condition of S&E research space. That being the case, changes in the percentages of institutions reporting the adequacy and condition of their research space must be interpreted cautiously.

For the first time, the 1996 survey asked respondents to report additional space needed to support current S&E research program commitments. They also were asked to indicate the amount of space rated as needing major renovation or replacement, which is funded and scheduled to be renovated or replaced. Responses to these questions, included as parts of Items 2 and 3, are presented in Chapter 6.

Findings

Was the Amount of S&E Research Space Sufficient for Current Research Commitments?

Reports of inadequate research space varied across field and institution type. The percentage of institutions indicating that the amount of available S&E research space was inadequate ranged from 30 percent for mathematics to 66 percent for the medical sciences in medical schools (Table 2-1). Over half of all institutions reported inadequate amounts of space in the medical sciences in medical schools (66 percent), engineering (57 percent), the medical sciences outside of medical schools (57 percent), the physical sciences (54 percent), the biological sciences outside of medical schools (53 percent), and agricultural sciences (52 percent). Nearly half of the institutions reported inadequate amounts of space in five additional fields: the social sciences (47 percent); the biological sciences in medical schools (46 percent); earth, atmospheric, and ocean sciences (46 percent); the computer sciences (44 percent); and psychology (44 percent). About one third (30 percent) of the institutions reported that mathematics, the remaining field, had inadequate research space.

Table 2-1. Percentage of institutions reporting inadequate amounts of science and engineering (S&E) research space in existing fields by institution type and field: 1996 [1]

Field	*Total*	*Institution type*		
		Doctorate-granting		*Nondoctorate-granting*
		Top 100 in research expenditures	*Other*	
Biological sciences--outside medical school	53%	61%	49%	52%
Physical sciences	54	56	55	51
Psychology	44	43	42	42
Social sciences	47	55	42	44
Mathematics	30	30	26	32
Computer sciences	44	39	36	47
Earth, atmospheric, and ocean sciences	46	46	39	47
Engineering	57	57	57	48
Agricultural sciences	52	30	50	35
Medical sciences--outside medical school	57	44	65	47
Medical sciences--medical school	66	40	69	-
Biological sciences--medical school	46	31	38	-

[1] Includes both "inadequate amount" and "nonexistent space, but needed."

KEY: "-" = Number of institutions less than 5; included in total.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

The top 100 institutions were most likely to indicate inadequate research space in the biological sciences outside of medical schools, with 61 percent reporting this to be the case. Three other fields were reported to have inadequate research space by over half of the top 100 institutions: the physical sciences (56 percent), the social sciences (55 percent), and engineering (57 percent).

Medical sciences space was most likely to be reported as inadequate by the other doctorate-granting universities, both outside medical schools (65 percent) and within (69 percent). In fact, the percentages of those institutions indicating medical science space to be inadequate were much higher than for the top 100 institutions.

Two fields, the biological sciences outside of medical schools (52 percent) and the physical sciences (51 percent), were listed by over half of the nondoctorate-granting institutions as having inadequate S&E research space.

What Was the Condition of S&E Research Space?

Over a third (37 percent) of the S&E research space at research-performing institutions was rated as "suitable for use in the most scientifically sophisticated research." While 38 percent of the S&E research space at doctorate-granting institutions also was rated this way, as was 37 percent at the other doctorate-granting institutions, less than a quarter (24 percent) of the S&E research space at nondoctorate-granting institutions was reported in the highest quality category (Table 2-2).

Table 2-2. Institutional assessment of the quality and condition of science and engineering (S&E) research space by institution type: 1996
[Percentage of space]

Institution type	*Suitable for the most scientifically competitive research in the field*	*Effective for most levels of research*	*Requires major renovation or replacement*
Total	37%	44%	18%
Doctorate-granting	38	43	18
Top 100 in research expenditures	38	43	19
Other	37	45	17
Nondoctorate-granting	24	57	18

NOTE: Percentages may not total to 100 due to rounding.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Colleges and universities classified a total of 18 percent of their S&E research space as requiring either major repair/renovation or replacement. There was general consistency among the different types of institutions regarding the amount of S&E research space in this condition, with 19 percent of the S&E research space at the top 100 doctorate-granting institutions, 17 percent of the research space at other doctorate-granting institutions, and 18 percent of the research space at the nondoctorate-granting institutions requiring major repair/renovation or replacement.

Such similarities across institution types mask large differences in actual amounts of space. The 18 percent of space rated as needing major repair/renovation at the top 100 universities, for instance, actually represents 17.6 million NASF, whereas the 18 percent of space rated in the same category at nondoctorate-granting institutions represents only 1.1 million. In total, the nation's research-performing institutions reported that 24.5 million NASF of research space required major repair/renovation or replacement.

How Much S&E Research Space in Each Field Required Either Repair/Renovation or Replacement?

Similar to 1994, in 1996, institutions reported research space in the agricultural sciences to have the greatest need for repair/renovation or replacement. Of the 22 million NASF of S&E research space in the agricultural sciences (Table 1-6), 5.3 million NASF were assessed as requiring repair/renovation or replacement (Table 2-3). This space is approximately one quarter of the total S&E research space in that field. This relatively large need is concentrated in a small number of institutions (only 20 percent of all research-performing institutions had research space in the agricultural sciences).

Table 2-3. Trends in the amount of science and engineering (S&E) research space requiring repair/renovation or replacement by field: 1988-1996
[NASF in millions]

Field	*1988*	*1990*	*1992* [1]	*1994* [1]	*1996*
Biological sciences--outside medical school	2.4	2.5	2.6	3.2	3.4
Physical sciences	2.9	2.7	2.4	3.1	3.4
Psychology	0.4	0.4	0.3	0.4	0.4
Social sciences	0.3	0.3	0.4	0.3	0.5
Mathematics	0.1	0.1	0.1	0.1	0.1
Computer sciences	0.2	0.1	0.1	0.1	0.2
Earth, atmospheric, and ocean sciences	0.9	0.9	0.8	1.3	1.3
Engineering	2.2	2.6	2.3	3.2	4.0
Agricultural sciences	3.6	4.6	5.2	4.4	5.3
Medical sciences--outside medical school	0.8	0.9	1.0	1.0	1.5
Medical sciences--medical school	2.4	1.9	2.7	2.9	3.6
Biological sciences--medical school	1.0	1.2	1.6	1.6	1.6

[1] Includes both "requires major repair or renovation" and "requires replacement."

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Institutions also indicated (in 1996) that 4 million NASF of engineering research space required repair/renovation or replacement. Medical sciences in medical schools contained 3.6 million NASF, and the biological sciences outside of medical schools and the physical sciences each contained 3.4 million in need of repair/renovation or replacement.

Since 1988, the amount of research space requiring repair/renovation or replacement in many of the S&E fields increased. In the agricultural sciences, the amount increased from 3.6 million NASF in 1988 to 5.3 million in 1996. In every year of the survey, the agricultural sciences were reported to be the field with the greatest amount of space in this condition. The amount of S&E research space in the biological sciences outside of medical schools requiring repair/renovation or replacement increased from 2.4 million NASF in 1988 to 3.4 million in 1996. Engineering space in this condition grew from 2.2 million NASF to 4.0 million.

Chapter 3

The Construction of S&E Research Space

Highlights . . .

- In fiscal years 1994-1995, research-performing institutions constructed 9.5 million net assignable square feet (NASF) of science and engineering (S&E) research space. This space was less than that constructed in the 1992-1993 fiscal years, when 12.4 million NASF of S&E research space were constructed, and less than that constructed in any other period since the National Science Foundation began collecting data on S&E research facilities.
- Research-performing institutions spent $2.8 billion to construct S&E research space in fiscal years 1994-1995, a decline of $272 million since 1992-1993. This decline in the amount of space constructed and the amount of dollars spent to construct space occurred in both types of doctorate-granting institutions, but did not occur in nondoctorate-granting institutions.
- Engineering, the medical sciences in medical schools, and the physical sciences accounted for more than half of the $2.8 billion in construction spending by research-performing institutions in fiscal years 1994-1995.
- For fiscal years 1996-1997, research-performing institutions were scheduled to spend $3.1 billion to construct S&E research space and another $245 million to construct central campus infrastructure.

Background

In 1994, the National Science Foundation noted the first declines in spending for construction since data collection on S&E research facilities began in 1986 (National Science Foundation, 1994). Reductions in spending on higher education on the part of both Federal and state governments in the early 1990s followed a period when many colleges and universities had deferred maintenance on their buildings. At the same time, changes in technology altered the ways scientists and engineers now conduct research and train students, generating a need for new laboratories and additional research space.

What follows is a discussion of the current state of construction for S&E research in research-performing colleges and universities, the object being to determine whether the declines in construction spending noted in 1994 have continued to drop.

The Survey Questions

Institutions were asked to estimate the research-related costs and space for construction projects begun during fiscal years 1994-1995, and to make the same estimates for projects scheduled for fiscal years 1996-1997. Project start-up was defined as the fiscal year in which construction began or was expected to begin. In the case of multiyear projects, total project costs were allocated to the fiscal year in which the construction began.

The reported costs, defined as the costs to complete a project, included planning, site preparation, construction, fixed equipment, non-fixed equipment costing $1 million or more, and building infrastructure. If a project was to serve both research and nonresearch purposes, respondents were asked to prorate the construction costs and space estimates so that the research-related portion of the costs was reflected (see Items 4a and 4b of the survey in Appendix C).

Institutions were also asked to report planned expenditures for central campus infrastructure (see Item 6 of the survey in Appendix C). Central campus infrastructure was defined as those systems that exist between the buildings of a campus and the nonarchitectural elements of campus design. Examples included central wiring for telecommunications systems, waste storage and disposal facilities, electrical wiring between buildings, central heating and air exchange systems, drains, sewers, roadways, walkways and parking systems. Plumbing, lighting, wiring, air exchange systems and the like that exist within a building or within five feet of the building foundation were considered building infrastructure and were excluded from this definition of central campus infrastructure.

Data Considerations

Data presented below reflect the extent of construction underway in fiscal years 1994-1995. Tables that report expenditures or costs over time are presented in constant dollars, with current-dollar tables found in Appendix F. Constant dollars are inflation-adjusted dollars and compensate for variations in the purchasing power of the dollar over time.

The specific deflator used in this report is the Bureau of the Census Composite Fixed-Weighted Price Index for Construction, which tracks inflation within the construction industry more closely than does a general index. The fixed-weighted price index reflects changes in prices, and remains unaffected by changes in the mix of construction projects during any given year (see Appendix A, "Technical Notes," for further discussion of the price index).

The 1994 report presented trends in 1993 constant dollars, and was the first time constant dollars were used in any of the biennial NSF facilities reports. This report adjusts dollar figures to 1995 constant dollars. Thus, constant dollar figures in the 1994 and 1996 reports cannot be compared directly.

The term "construction" in this chapter and throughout this report refers to building facilities that currently do not exist.

It also should be noted that changes in construction spending from one year to another can result from projects at a small number of institutions. Given the costs of constructing S&E research facilities, a large increase could reflect a new building on one or two campuses. We note these situations when appropriate.

Findings

How Much S&E Research Space Did Institutions Construct?

Between the 1986-1987 and the 1992-1993 fiscal years, the overall amount of S&E research space constructed by research-performing colleges and universities increased. This aggregate trend did not continue, however, between the 1992-1993 and 1994-1995 fiscal years. In 1992-1993, research-performing institutions constructed over 12.4 million NASF of S&E research space. In 1994-1995, the amount under construction dropped to 9.5 million NASF, a total less than any other period since the National Science Foundation began collecting data on S&E research facilities[3] (Table 3-1).

Table 3-1. Trends in net assignable square feet (NASF) of science and engineering (S&E) research space under construction by institution type: 1986-1995
[NASF in thousands]

Institution type	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*
Total	9,922	10,647	11,433	12,405	9,521
Doctorate-granting	8,908	9,840	11,022	12,014	8,818
Top 100 in research expenditures	7,261	6,073	6,972	8,197	6,426
Other	1,647	3,767	4,050	3,818	2,391
Nondoctorate-granting	1,014	807	411	391	703

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Of interest are the differences between research-performing, doctorate-granting universities and nondoctorate-granting institutions. Among doctorate-granting universities, the amount of NASF constructed declined from 12 million NASF to 8.8 million NASF between fiscal years 1992-1993 and 1994-1995, a decrease of approximately 32 percent. The amount of construction at the top 100 institutions dropped less, in relative terms (22 percent), than did the amount at other doctorate-granting institutions (37 percent).

The amount of construction at nondoctorate-granting institutions increased for the first time between the 1992-1993 and 1994-1995 fiscal years, from 391,000 NASF to 703,000 NASF. This increase resulted from large construction projects at a few institutions.

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[3] Although the amount of S&E research space under construction declined between fiscal years 1992-1993 and 1994-1995, the total amount of S&E research space continued to increase over this period (see Table 1-4). There are a number of ways the amount of S&E research space can increase without the addition of newly constructed facilities. Space used for instruction or other purposes, for example, can be converted into research space. Also, the definition of research used in this survey limits space to that which supports research activities that are budgeted and accounted for. Thus, space might exist in a given survey cycle, but if it did not support funded research activities, it should not be included in the space reported in question 1.

How Much did Institutions Spend on the Construction of S&E Research Space?

Consistent with trends in the amount of S&E research space constructed, total construction expenditures declined between the 1992-1993 and 1994-1995 fiscal years, in constant dollar terms. However, construction spending actually began to decrease before the decrease in the amount of space being constructed. The first decrease in construction spending occurred between the 1990-1991 and 1992-1993 fiscal years (Table 3-2). This incongruency between trends in the amount of S&E research space constructed and construction expenditures could reflect widely varying construction costs--costs that are affected by the S&E field in which space is constructed, the complexity of the research space, and geographic location.

In fiscal years 1994-1995, total expenditures for S&E research space construction projects in research-performing institutions totaled $2.8 billion, a decline of $272 million in constant dollars from fiscal years 1992-1993. This decline in expenditures for constructing S&E research space represents a continuation of a trend that began between fiscal years 1990-1991 and 1992-1993. In constant dollar terms, construction spending declined $313 million between those fiscal years (Table 3-2 and Figure 3-1).

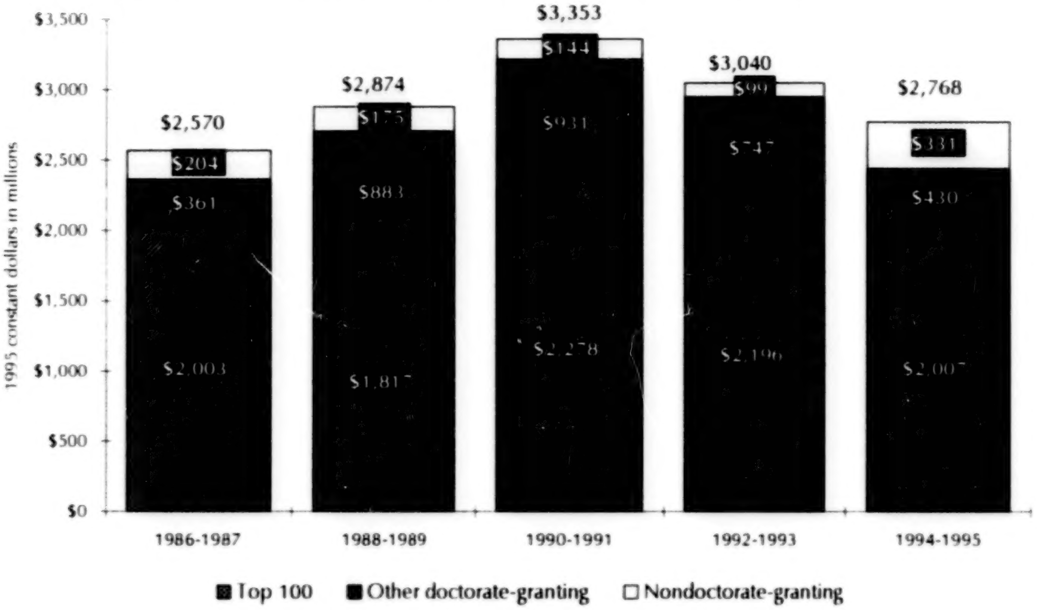
Table 3-2. Trends in expenditures to construct science and engineering (S&E) research facilities by institution type: 1986-1995
[Constant 1995 dollars in millions][1]

Institution type	1986-1987	1988-1989	1990-1991	1992-1993	1994-1995
Total	$2,570	$2,874	$3,353	$3,040	$2,768
Doctorate-granting	2,365	2,700	3,207	2,940	2,437
Top 100 in research expenditures	2,003	1,817	2,278	2,193	2,007
Other	361	883	931	747	430
Nondoctorate-granting	204	175	144	99	331

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Figure 3-1. Trends in S&E Construction Expenditures, by Institution Type: 1986-1995



SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Both types of doctorate-granting institutions experienced decreases in construction spending in 1995 constant dollar terms. Nondoctorate-granting institutions experienced an increase of $232 million during fiscal years 1994-1995, compared to fiscal years 1992-1993. The other doctorate-granting institutions had the largest decline in construction spending for S&E research space between fiscal years 1992-1993 and 1994-1995, from $747 million to $430 million in constant dollar terms (a 42 percent decline).

How Much Did Institutions Spend on the Construction of S&E Research Space in Different Fields?

Engineering, the medical sciences in medical schools, and the physical sciences accounted for more than one-half of the $2.8 billion in construction spending by research-performing institutions in fiscal years 1994-1995 (Table 3-3). Academic institutions spent $575 million to construct engineering research space, $525 million for research space in the medical sciences in medical schools, and $426 million for research space in the physical sciences.

Table 3-3. Trends in expenditures for capital projects to construct science and engineering (S&E) research facilities by field: 1986-1997
[Constant 1995 dollars in millions][1]

Field	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 (scheduled)*
Total	$2,570	$2,874	$3,353	$3,040	$2,768	$3,072
Biological sciences-- outside medical school	406	462	508	316	388	507
Physical sciences	228	468	484	364	426	390
Psychology	29	29	41 [2]	17	42	38
Social sciences	48	56		48	112	54
Mathematics	2	10	14	11	2	25
Computer sciences	77	76	45	51	46	31
Earth, atmospheric, and ocean sciences	71	95	191	133	33	240
Engineering	538	453	445	309	575	429
Agricultural sciences	188	177	197	227	150	212
Medical sciences-- outside medical school	254	71	170	173	122	243
Medical sciences-- medical school	378	684	738	907	525	672
Biological sciences-- medical school	174	211	429	369	226	214
Other	174	82	90	111	122	16

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

[2] Psychology and social sciences were not differentiated in the questionnaire item for the 1990-1991 period.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Institutions spent the next largest amounts of money to construct research space in the biological sciences outside of medical schools ($388 million), the biological sciences in medical schools ($226 million), and the agricultural sciences ($150 million). The largest increase in spending for the construction of S&E research space between fiscal years 1992-1993 and 1994-1995 occurred in engineering, which leaped from $309 million to $575 million.

Most fields experienced a decrease in construction spending between fiscal years 1992-1993 and 1994-1995. After its relatively high level of funding in 1994-1995, spending to construct medical science research space in medical schools decreased by $382 million, from $907 million in fiscal years 1992-1993, to $525 million in 1994-1995. Funding in the biological sciences in medical schools also fell steeply, from $369 million in 1992-1993 to $226 million in 1994-1995. Funding for research space in the earth, atmospheric, and ocean sciences declined from $133 million to $33 million during the same period.

How Much Were Institutions Scheduled to Spend on the Construction of S&E Research Space and on Central Campus Infrastructure?

For fiscal years 1996-1997, research-performing institutions were scheduled to spend $3.1 billion to construct S&E research space. If all of this construction were to occur, it would represent an increase of $304 million over the amount actually spent on construction, $2.8 billion, in the 1994-1995 fiscal years.[4]

This increase is not, however, uniform across different types of research-performing institutions. Nondoctorate-granting institutions expected a decline in construction spending in 1996-1997, from a high of $331 million in 1994-1995 (Table 3-2) to $264 million over the next two fiscal years.

Table 3-4. Scheduled construction expenditures for science and engineering (S&E) research space and central campus infrastructure by institution type: 1996-1997
(Dollars in millions)

Institution type	*Scheduled Construction*		
	S&E Research Space	*Central Campus Infrastructure*	*Total*
Total	$3,072	$245	$3,317
Doctorate-granting	2,807	228	3,035
Top 100 in research expenditures	2,104	187	2,291
Other	704	41	745
Nondoctorate-granting	264	18	282

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

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[4] It should be noted, however, that doctorate-granting universities generally do not spend on the construction of S&E research space as much as they report planning to spend. Nondoctorate-granting institutions, on the other hand, typically spend more than they plan to.

Research-performing institutions were scheduled to spend another $245 million to construct central campus infrastructure space (Table 3-4).[5] Ninety-three percent of the expenditures on infrastructure space--$228 million--was scheduled for construction at doctorate-granting universities. Only 7 percent was scheduled at nondoctorate-granting institutions.

It should be noted that increases in scheduled construction varied by S&E field. The largest increases were scheduled for the earth, atmospheric, and ocean sciences, from $33 million in 1994-1995 to $240 million in 1996-1997; mathematics, from $2 million to $25 million; agricultural sciences, from $150 million to $212 million; biological sciences outside of medical schools, from $388 million to $507 million; and medical sciences outside of medical schools, from $122 million to $243 million (Table 3-3).

To What Extent Were Colleges and Universities Involved in Constructing S&E Research Space?

Consistent with the decline in both the amount of space being constructed and construction expenditures for S&E research space at the doctorate-granting institutions, the percentage of institutions undertaking construction projects declined. In 1992-1993, 44 percent of all doctorate-granting universities reported S&E research construction (Table 3-5); for the 1994-1995 fiscal years, 42 percent reported construction.

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[5] Questions regarding the construction of central campus infrastructure space were not included in the 1994 survey.

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Table 3-5. Trends in the percentage of institutions starting capital projects to construct science and engineering (S&E) research facilities by institution type: 1986-1997

Institution type	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 (scheduled)*
Total	37%	44%	37%	33%	29%	29%
Doctorate-granting	47	53	57	44	42	40
Top 100 in research expenditures	72	71	81	79	75	64
Other	34	44	45	28	26	29
Nondoctorate-granting	25	32	12	15	13	13

NOTE: As used here, capital projects are construction projects with prorated costs of $100,000 or more for affected research space. Percentages are based on the number of institutions with some science and engineering research space.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Like the doctorate-granting institutions, the percentage of nondoctorate institutions reporting S&E research construction activity dropped slightly, from 15 percent in 1992-1993, to 13 percent in 1994-1995, despite the increase in construction space and expenditures in nondoctorate-granting institutions. Once again, these figures reflect the large scope of construction projects undertaken by relatively few nondoctorate-granting institutions in 1994-1995.

For the next two fiscal years, 1996-1997, 29 percent of all research-performing institutions reported that they were scheduled to undertake S&E research construction projects (the same percentage of institutions involved in construction in 1994-1995). Fewer top 100 institutions, however, indicated they had construction projects scheduled than actually occurred in previous years. Only 64 percent of those universities reported scheduled construction.

In What Fields Were Construction Projects Undertaken?

Since fiscal years 1986-1987, construction projects have been more likely to occur in some S&E fields than in others. During fiscal years 1994-1995, approximately one-fourth (24 percent) of the institutions with medical schools began construction projects for the medical sciences (Table 3-6). Twenty-one percent of the research-performing institutions with agricultural science research space and 15 percent of those with engineering research space started capital projects during the same period. Other S&E fields in which capital projects were begun included the physical sciences and the biological sciences within medical schools (10 percent each).

Table 3-6. Trends in the percentage of institutions starting projects to construct science and engineering (S&E) research facilities by field: 1986-1997

Field	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 (scheduled)*
Total	37%	44%	37%	33%	29%	29%
Biological sciences--outside medical school	9	19	10	10	8	10
Physical sciences	9	15	11	9	10	11
Psychology	5	3	7[1]	2	2	1
Social sciences	5	4		3	4	3
Mathematics	1	2	4	2	1	1
Computer sciences	8	6	7	4	2	2
Earth, atmospheric, and ocean sciences	9	6	15	9	5	5
Engineering	28	18	16	17	15	10
Agricultural sciences	38	33	30	27	21	24
Medical sciences--outside medical school	7	5	13	11	6	8
Medical sciences--medical school	32	23	41	33	24	25
Biological sciences--medical school	20	26	33	20	10	11

[1] Psychology and social sciences were not differentiated in the questionnaire item for the 1990-1991 period.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Chapter 4

The Repair/Renovation of S&E Research Space

Highlights . . .

- Expenditures to repair/renovate science and engineering (S&E) research facilities costing over $100,000 increased between fiscal years 1992-1993 and 1994-1995, from $905 million to $1.1 billion in constant dollar terms.
- Repair/renovation expenditures as a proportion of total capital expenditures (construction and repair/renovation) has increased steadily since the 1990-1991 fiscal years.
- In fiscal years 1990-1991, total repair/renovation costs represented 25 percent of all capital project spending. In fiscal years 1994-1995, repair/renovation expenditures accounted for 30 percent of total capital project expenditures.
- Approximately 31 percent of all repair/renovation expenditures for fiscal years 1994-1995 occurred in the two S&E fields within medical schools: the biological sciences and the medical sciences. These expenditures totaled $327 million.
- For fiscal years 1996-1997, institutions were scheduled to spend $1.3 billion to repair/renovate existing S&E research space and $477 million to repair/renovate the central campus infrastructure.
- Forty-five percent of all research-performing colleges and universities undertook some type of repair/renovation project costing over $100,000 during fiscal years 1994-1995.

Background

Rapid changes in science and technology, coupled with deferred renovation to S&E facilities in the 1980s and 1990s, have raised concerns about the quality of S&E research space. The previous chapter revealed a decline in spending to construct S&E research space between fiscal years 1992-1993 and 1994-1995. Here, we examine the extent to which research-performing colleges and universities were engaged in the repair/renovation of S&E research space (and the fields in which this activity occurred).

The Survey Questions

Institutions were asked to estimate the research-related costs and space for repair/renovation projects begun during fiscal years 1994-1995, and to make the same estimates for projects scheduled to begin in fiscal years 1996-1997. The project start-up time was defined as the fiscal year in which actual work began (or was expected to begin). In the case of projects conducted over many years, total project costs were allocated to the fiscal year in which the repair/renovation began.

The reported costs, defined as the cost to complete a project, included planning, site preparation, fixed equipment, non-fixed equipment costing $1 million or more, and building infrastructure. Projects over $100,000 and under $100,000 were reported separately. If a project was to serve both research and nonresearch purposes, repair/renovation costs and space estimates were to be prorated to reflect the research-related portion of the cost (see Items 4a and 4b in Appendix C).

Data Considerations

Data reflect the extent of repair/renovation activity underway in fiscal years 1994-1995. Tables that report expenditures or costs over time are presented in constant dollars; current dollar tables are found in Appendix F. Constant dollars are inflation-adjusted dollars and compensate for variations in the purchasing power of the dollar over time.

The specific deflator used in this report is the Bureau of the Census Composite Fixed-Weighted Price Index for Construction, which more closely tracks inflation within the construction industry than does a more general index. The fixed-weighted price index reflects changes in prices and remains unaffected by changes in the mix of construction projects during any given year. (See Appendix A, "Technical Notes," for further discussion of the price index.)

The 1994 report presented trends in 1993 constant dollars (the first time constant dollars were used in any of the biennial NSF facilities reports). Here, we adjust dollar figures to 1995 constant dollars, meaning that constant dollar figures in the 1994 and 1996 reports cannot be compared directly.

Findings

How Much Did Institutions Spend to Repair/Renovate S&E Research Space?

Expenditures for repair/renovation projects costing over $100,000 increased between fiscal years 1992-1993 and 1994-1995. In fiscal years 1992-1993, all research-performing institutions spent a total of $905 million. In fiscal years 1994-1995, they spent $1.1 billion, an increase of 17 percent. Spending at doctorate-granting institutions increased from $868 million to $981 million. At nondoctorate-granting institutions, spending more than doubled, from $37 million to $77 million (Table 4-1 and Figure 4-1).

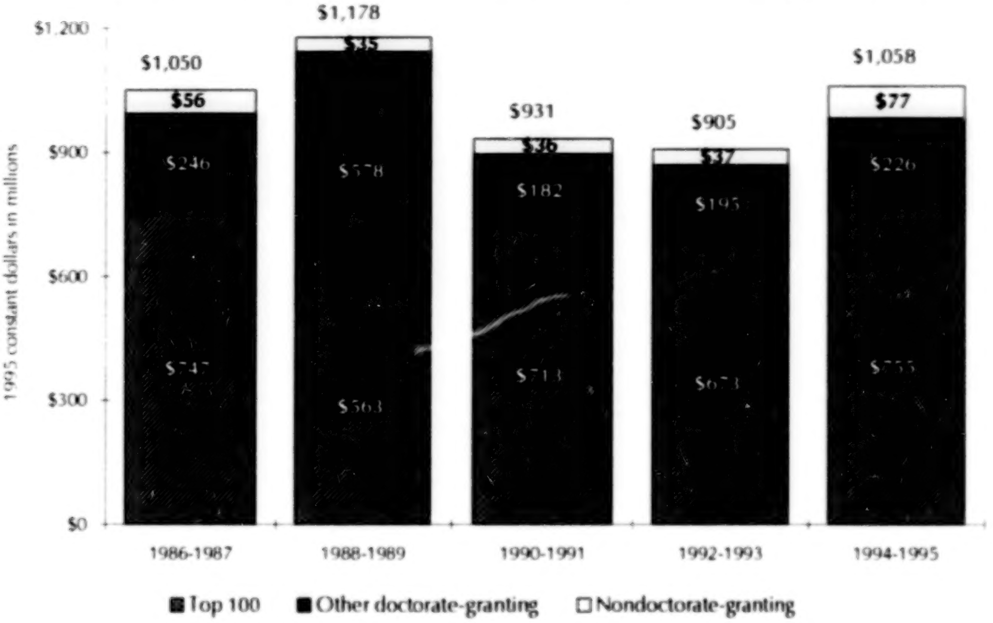
Table 4-1. Trends in expenditures for capital projects costing over $100,000 to repair/renovate science and engineering (S&E) research facilities by institution type: 1986-1995
[Constant 1995 dollars in millions][1]

Institution type	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*
Total	$1,050	$1,178	$931	$905	$1,058
Doctorate-granting	993	1,142	895	868	981
Top 100 in research expenditures	747	563	713	673	755
Other	246	578	182	195	226
Nondoctorate-granting	56	35	36	37	77

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Figure 4-1. Trends in S&E Repair/Renovation Expenditures, by Institution Type: 1986-1995



SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

While expenditures for repair/renovation costing over $100,000 increased between fiscal years 1992-1993 and 1994-1995, expenditures for S&E research facility repair/renovation projects costing less than $100,000 decreased during this same period (Table 4-2). Total expenditures for repair/renovation projects costing less than $100,000 decreased by 48 percent between fiscal years 1992-1993 and 1994-1995 (from $261 million to $135 million). The sharpest decline occurred at the top 100 doctorate-granting institutions (a decrease of 47 percent, from $194 million in fiscal years 1992-1993, to $102 million in fiscal years 1994-1995).

It is possible that this decline may be attributed to a general rise in the cost of repairing S&E research space over time, making it increasingly difficult for colleges and universities to repair S&E research space for less than $100,000.

Table 4-2. Trends in expenditures for science and engineering (S&E) research facilities repair/renovation projects costing less than $100,000 by institution type: 1990-1995

[Constant 1995 dollars in millions[1]]

Institution type	*1990-1991*	*1992-1993*	*1994-1995*
Total	$164	$261	$135
Doctorate-granting	159	225	129
Top 100 in research expenditures	109	194	102
Other	50	31	27
Nondoctorate-granting	5	36	6

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

What Proportion of Total Capital Project Spending Is Represented by Repair/Renovation?

Since the 1990-1991 fiscal years, spending to repair/renovate existing S&E research space has increased faster than spending to construct space.[1] In the 1990-1991 period, total repair/renovation costs--both under and over $100,000--represented 25 percent of all capital project spending, both on construction and repair/renovation. During the next two fiscal years, expenses to repair/renovate existing S&E research space represented 28 percent of total capital project spending. In the most recent time period (1994-1995), institutions spent a total of $1.2 billion to repair or renovate research space, accounting for 30 percent of total capital project funding, or $3.9 billion (Table 4-3).

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[1] Trends are reported from the 1990-1991 fiscal years because this was the first time period for which institutions reported repair/renovation expenses both for projects costing over $100,000 and for projects costing less than $100,000.

Table 4-3. Science and engineering (S&E) repair/renovation expenditures as a proportion of total capital project expenditures by institution type: 1990-1995

[Constant 1995 dollars in millions[1]]

Institution type	**1990-91**			**1992-93**			**1994-95**		
	Total Capital Projects	***Repair/ Renovation***	***R/R as %***	***Total Capital Projects***	***Repair/ Renovation***	***R/R as %***	***Total Capital Projects***	***Repair/ Renovation***	***R/R as %***
Total	$4,448	$1,095	25%	$4,206	$1,166	28%	$3,951	$1,183	30%
Doctorate-granting	4,261	1,054	25	4,033	1,093	27	3,537	1,100	32
Top 100 in research expenditures	3,100	822	27	3,060	867	28	2,988	847	28
Other	1,163	232	2	973	226	23	683	253	37
Nondoctorate-granting	185	41	22	172	73	42	414	83	2

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Repair/renovation expenditures as a proportion of total capital project spending increased the most in other doctorate-granting institutions between the 1992-1993 and 1994-1995 fiscal years (from 23 percent to 37 percent). In nondoctorate-granting institutions, repair/renovation expenditures, while increasing from $73 million in 1992-1993 to $83 million in 1994-1995, declined as a proportion of total capital project spending (from 42 percent to 20 percent)--a decline that can be attributed to the large increase in construction expenditures in nondoctorate-granting institutions noted in Chapter 3.

How Did Repair/Renovation Expenditures Vary by S&E Field?

Institutions spent more to repair and renovate S&E research space in the medical sciences in medical schools--$226 million--than in any other field during fiscal years 1994-1995 (Table 4-4). Repair/renovation expenditures for the two sciences in medical schools combined (biological sciences and medical sciences) represented approximately 31 percent of all such expenditures in fiscal years 1994-1995. Repair/renovation expenditures for both of these fields, however, were lower in both constant dollar terms and as a proportion of total repair/renovation spending in fiscal years 1994-1995, than in fiscal years 1992-1993.

Other S&E fields in which research-performing institutions spent over $100 million include the physical sciences ($192 million), engineering ($150 million), and the biological sciences outside of medical schools ($127 million).

Table 4-4. Trends in expenditures for capital projects to repair/renovate science and engineering (S&E) research facilities by field: 1986-1997 [Constant 1995 dollars in millions][1]

Field	1986-1987	1988-1989	1990-1991	1992-1993	1994-1995	1996-1997 (scheduled)
Total	$1,050	$1,178	$931	$905	$1,058	$1,258
Biological sciences--outside medical school	183	147	152	117	127	187
Physical sciences	132	192	170	145	192	241
Psychology	17	13	35[2]	11	28	29
Social sciences	45	10		11	40	60
Mathematics	5	13	6	2	6	1
Computer sciences	22	11	24	4	8	13
Earth, atmospheric, and ocean sciences	26	21	18	34	35	41
Engineering	176	422	92	150	150	222
Agricultural sciences	25	27	39	15	72	48
Medical sciences--outside medical school	65	28	59	30	59	65
Medical sciences--medical school	218	188	187	253	226	132
Biological sciences medical school	97	89	138	125	101	175
Other	38	19	6	8	12	42

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

[2] Psychology and social sciences were not differentiated in the questionnaire item for the 1990-1991 period.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

How Much Were Institutions Scheduled to Spend on the Repair/Renovation of Existing S&E Research Space and on Central Campus Infrastructure?

For fiscal years 1996-1997, research-performing institutions were scheduled to spend $1.258 billion to repair/renovate existing research space, and $477 million to repair/renovate the central campus infrastructure. Thus, about 27 percent of the total repair/renovation expenditures scheduled for 1996-1997 would be used to repair the central campus infrastructure. Institutions were scheduled to spend more on central campus infrastructure repairs than construction for central campus infrastructure ($477 million versus $245 million). The scheduled repair/renovation of S&E research space, however, was considerably less than that scheduled for construction ($1.3 billion versus $3.1 billion). See Table 3-4 for scheduled construction expenditures, and Table 4-5, below, for scheduled repair/renovation expenditures.

Table 4-5. Scheduled repair/renovation expenditures for science and engineering (S&E) research space and central campus infrastructure by institution type: 1996-1997
(Dollars in millions)

Institution type	*Scheduled Repair/Renovation* *S&E Research Space*	 *Central Campus Infrastructure*	 *Total*
Total	$1,258	$477	$1,735
Doctorate-granting	1,161	449	1,610
Top 100 in research expenditures	889	393	1,282
Other	272	56	328
Nondoctorate-granting	97	27	124

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Repair/renovation expenditures were scheduled to increase over 1994-1995 levels in all types of institutions, in 1996-1997. In the top 100 institutions, the increase would total $134 million (from $755 million to $889 million). Other doctorate-granting universities were scheduled to increase their repair/renovation expenditures by $46 million (from $226 million to $272 million) across these fiscal years, and the nondoctorate-granting institutions indicated an increase of $20 million (from $77 million to $97 million). It has generally been the case, however, that the amount scheduled to repair/renovate existing S&E research space does not always match what is spent.

To What Extent Were Colleges and Universities Involved in Repair/Renovation Projects?

Forty-five percent of all research-performing colleges and universities undertook some type of repair/renovation costing over $100,000, during fiscal years 1994-1995 (Table 4-6). Only 29 percent of all institutions were involved in construction projects during that same period. (See Table 3-5 in Chapter 3 for a comparison of construction and repair/renovation.)

Table 4-6. Trends in the percentage of institutions starting capital projects to repair/renovate science and engineering (S&E) research facilities by institution type: 1986-1997

Institution type	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 (scheduled)*
Total	56%	48%	47%	46%	45%	43%
Doctorate-granting	78	71	74	61	61	55
Top 100 in research expenditures	96	85	91	90	88	78
Other	44	63	65	48	49	45
Nondoctorate-granting	28	20	14	25	24	28

NOTE: As used here, capital projects are repair/renovation projects with prorated costs of $100,000 or more for affected research space. Percentages are based on the number of institutions with some science and engineering research space.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Similar percentages of institutions undertook repair/renovation projects in fiscal years 1992-1993, and in 1994-1995. In 1992-1993, 46 percent of all research-performing colleges and universities undertook some type of repair/renovation project; during the next two fiscal years, 45 percent were engaged in such projects. Little fluctuation occurred across different types of institutions.

In What Fields Were Repair/Renovation Projects Undertaken?

Repair/renovation projects were more likely to have occurred in some S&E fields than others. Table 4-7 shows that during fiscal years 1994-1995, repair/renovation projects were most likely to have been started within medical schools in either the medical sciences (55 percent) or the biological sciences (46 percent). Research-performing institutions also began repair/renovation projects in engineering (29 percent), the agricultural sciences (27 percent), and the physical sciences (23 percent).

Table 4-7. Trends in percentage of institutions starting capital projects to repair/renovate science and engineering (S&E) research facilities by field: 1986-1997

Field	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 (scheduled)*
Total	56%	48%	47%	45%	44%	43%
Biological sciences--outside medical school	23	24	22	22	22	19
Physical sciences	22	23	22	22	23	22
Psychology	9	4	10[1]	4	5	7
Social sciences	8	5		5	8	8
Mathematics	8	8	4	2	3	1
Computer sciences	15	5	10	6	6	4
Earth, atmospheric, and ocean sciences	13	9	13	13	11	13
Engineering	42	37	24	30	29	23
Agricultural sciences	33	25	27	18	27	20
Medical sciences--outside medical school	12	12	22	16	16	17
Medical sciences--medical school	54	44	62	61	55	40
Biological sciences--medical school	45	41	46	39	46	44

[1] Psychology and social sciences were not differentiated in the questionnaire item for the 1990-1991 period.

NOTE: As used here, capital projects are repair/renovation projects with prorated costs of $100,000 or more for affected research space. Percentages are based on the number of institutions with some science and engineering research space.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Chapter 5

Funding of Research Facilities Projects

Highlights . . .

- Colleges and universities spent $2.8 billion to construct science and engineering (S&E) research facilities during fiscal years 1994 and 1995. The main source of construction funding was state and local governments ($1.2 billion, or 43 percent of all construction funding). There was a decrease in direct construction funding coming from the Federal government. Funds from the Federal government used to defray the indirect costs of conducting Federally funded research are counted as institutional funding.
- Repair/renovation projects were most likely to be funded through institutional sources; of the $1.1 billion of repair/renovation expenditures undertaken by colleges and universities in fiscal years 1994-1995, $433 million (41 percent) came from institutional funds. The proportion funded by the Federal government increased from 6 percent in 1990-1991 to 10 percent in 1994-1995 (a total in 1994-1995 of $111 million).
- State and local governments were the largest single source of funding for the construction of S&E research facilities in public institutions in fiscal years 1994-1995.
- For the 1994-1995 fiscal years, the single largest source of funding for the construction of S&E research facilities at the private universities in the top 100 was institutional funds. Private, other doctorate-granting institutions and nondoctorate-granting institutions relied primarily on private donations in fiscal years 1994-1995.

Background

Funding for both the construction of facilities and the repair/renovation of existing S&E research space continued to decline between fiscal years 1992-1993 and 1994-1995. The sources of funding for construction of space and the repair/renovation of existing space also changed between these two time periods. Below, we discuss how higher education institutions financed S&E capital projects between 1990 and 1995.

The Survey Question

Institutional respondents were asked to report funding sources for projects to construct S&E research facilities and to report funding sources to repair/renovate S&E research space. Respondents reported only the projects that cost over $100,000, and that began in fiscal years 1994-1995. Possible sources of funding included the Federal government, state or local governments, private donations, institutional funds, tax-exempt bonds, debt financing, and other sources. (See Item 5 of the survey in Appendix C.)

Data Considerations

Institutions reported construction and repair/renovation projects only for S&E research space exceeding $100,000. Considerable diversity of funding for these projects is possible. Federal funding, for instance, can include specific facilities support programs administered by the National Science Foundation (NSF) and the National Institutes of Health (NIH). Federal funding also might include non-peer-reviewed projects that are specified individually through Congressional legislation, rather than specific agency programs. Overlap between the funding categories is possible. For example, indirect costs included as institutional funds can come from Federal, state, and local governments, as well as from industry.

No survey information distinguished indirect cost recovery from other institutional funding (e.g., the use of operating or endowment funds).

Once again, dollar figures for years prior to 1995 were adjusted using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction. This adjustment means that dollar figures presented in this report do not match figures presented in previous reports.

Because of the support that state governments provide to public higher education, the control of the institution becomes relevant to discussions of the funding of capital projects involving S&E research space. Therefore, this chapter is the only one that distinguishes between public and private institutions.

Findings

How Did Colleges and Universities Fund Construction and Repair/Renovation of S&E Research Space?

Colleges and universities spent $2.8 billion to construct S&E research facilities during fiscal years 1994 and 1995. The main source of construction funding was state and local governments ($1.2 billion, or 43 percent of all construction funding). This was an increase from prior years, both relatively and absolutely; in fiscal years 1992-1993, state and local governments contributed $1.0 billion in constant 1995 dollars, or 34 percent of all construction funding.

Direct federal funding of construction at colleges and universities dropped from $537 million in 1990-1991, to $497 million in 1992-1993, to $207 million in 1994-1995. Corresponding to this decline, the relative proportion of construction costs contributed directly by the Federal government dropped from 16 percent in 1990-1991 and 1992-1993, to 7 percent in 1994-1995. However, substantial Federal funding comes through overheads on grants and contracts from the Federal government. These overhead payments are used to defray the indirect costs of conducting Federally funded research and are counted as institutional funding.

In addition to increases in state and local government funding, institutional funds accounted for a larger amount of construction dollars in 1994-1995 than in 1992-1993 ($442 million and $405 million respectively). Finally, the use of tax exempt bond funding for construction decreased from $670 million in 1992-1993, to $426 million in 1994-1995. An increase in other debt funding partly made up for this decrease, as other debt financing rose from $42 million in 1992-1993, to $146 million in 1994-1995 (Table 5-1).

Table 5-1. Trends in the sources of funding for construction of science and engineering (S&E) research facilities: 1990-1995
(constant 1995 dollars in millions)[1]

	Dollar contribution							
	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt	Other Debt	Other Sources
All Institutions								
1990-1991	$3,351.1	$536.7	$1,077.0	$397.0	$443.9	$819.1	$39.9	$37.2
1992-1993	3,039.8	496.5	1,047.2	325.5	404.7	670.3	42.1	53.7
1994-1995	2,767.6	206.5	1,180.8	360.0	442.0	426.1	145.7	6.5
	Relative contribution							
	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt	Other Debt	Other Sources
All Institutions								
1990-1991	100%	16%	32%	12%	13%	24%	1%	1%
1992-1993	100	16	34	11	13	22	1	2
1994-1995	100	7	43	13	16	15	5	0

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

NOTE: Percentages may not total to 100 due to rounding.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities*

Repair/renovation projects were more likely to be funded through institutional sources; of the $1.1 billion of repair/renovation expenditures undertaken by colleges and universities in 1994-1995, $433 million (41 percent) came from institutional funds. The proportion funded by the Federal government increased from 6 percent in 1990-1991, to 7 percent in 1992-1993, to 10 percent in 1994-1995 (a total in 1994-1995 of $111 million). Much of the increase in repair/renovation expenditures between 1992-1993 and 1994-1995 was funded by increasing contributions from institutional funds (from $358 million to $433 million over the period), from other debt funding (from $29 million to $79 million), and from private contributions (from $79 million to $111 million) (Table 5-2).

Table 5-2. Trends in the sources of funding for repair and renovation of science and engineering (S&E) research facilities: 1990-1995
(constant 1995 dollars in millions)[1]

	Dollar contribution							
	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt	Other Debt	Other Sources
All Institutions								
1990-1991	$929.8	$55.3	$273.7	$113.2	$400.1	$74.8	$9.0	$3.5
1992-1993	902.5	60.9	272.5	78.5	357.5	86.7	29.0	17.4
1994-1995	1,058.0	110.6	265.6	110.7	432.7	50.5	78.6	9.3
	Relative contribution							
	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt	Other Debt	Other Sources
All Institutions								
1990-1991	100%	6%	29%	12%	43%	8%	1%	0%
1992-1993	100	7	30	9	40	10	3	2
1994-1995	100	10	25	10	41	5	7	1

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

NOTE: Percentages may not total to 100 due to rounding.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities*

How Did Public Institutions Fund the Construction of S&E Research Space?

The source of funding for S&E construction projects in public, research-performing institutions varied across time and by institutional type (Table 5-3 and Figure 5-1).

Table 5-3. Trends in the sources of funding for construction of science and engineering (S&E) research facilities at public institutions: 1990-1995 (constant 1995 dollars in millions)[1]

	Dollar contribution							
Public Institutions	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt	Other Debt	Other Sources
Top 100								
1990-1991	$1,520.1	$172.8	$644.7	$135.7	$238.0	$312.7	$8.8	$7.3
1992-1993	1,565.4	233.0	611.8	136.1	159.9	405.4	17.5	1.8
1994-1995	1,231.5	107.6	612.9	86.8	130.9	273.3	13.5	6.5
Other doctorate-granting								
1990-1991	626.5	257.6	256.8	20.9	66.1	24.4	0.0	0.4
1992-1993	520.8	113.2	311.8	28.9	54.3	12.9	0.0	0.0
1994-1995	346.6	4.9	261.1	37.1	10.7	32.8	0.0	0.0
Nondoctorate-granting								
1990-1991	128.0	6.5	9.8	0.0	0.0	111.6	0.0	0.0
1992-1993	93.5	6.2	81.5	0.0	0.2	3.9	0.0	1.7
1994-1995	294.3	3.0	290.5	0.0	0.8	0.0	0.0	0.0

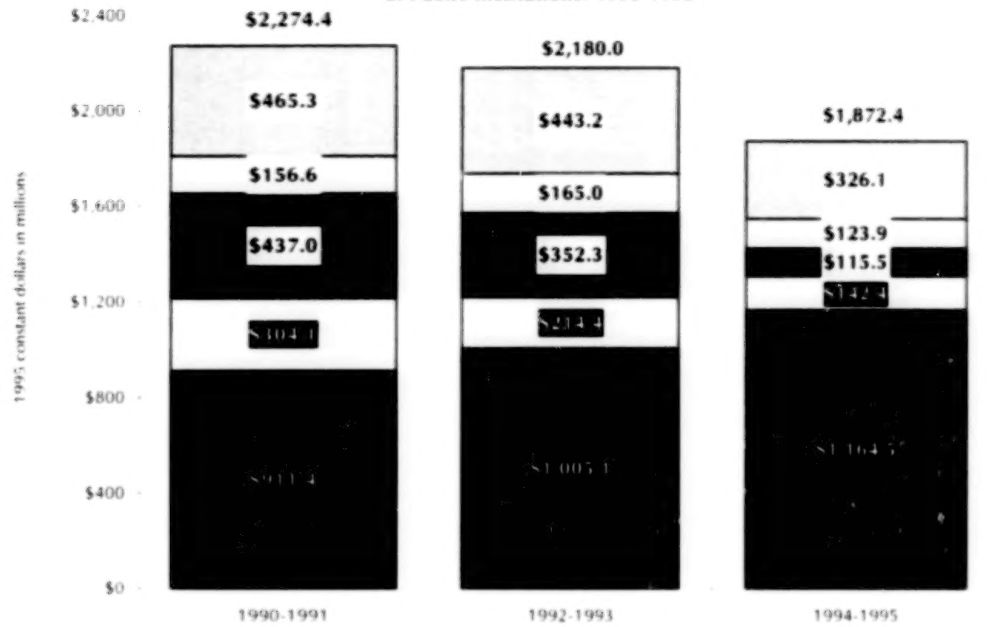
	Relative contribution							
Public Institutions	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt	Other Debt	Other Sources
Top 100								
1990-1991	100%	11%	42%	9%	16%	21%	1%	0%
1992-1993	100	15	39	9	10	26	1	0
1994-1995	100	9	50	7	11	22	1	1
Other doctorate-granting								
1990-1991	100	41	41	3	11	4	0	0
1992-1993	100	22	60	6	10	2	0	0
1994-1995	100	1	75	11	3	9	0	0
Nondoctorate-granting								
1990-1991	100	5	8	0	0	87	0	0
1992-1993	100	7	87	0	0	4	0	2
1994-1995	100	1	99	0	0	0	0	0

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

NOTE: Percentages may not total to 100 due to rounding.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Figure 5-1. Trends in the Sources of Funding for S&E Research Construction Projects at Public Institutions: 1990-1995



SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities

In constant dollars and in relative proportions (since fiscal years 1990-1991), the Federal government's contribution to S&E research construction projects was at its lowest in fiscal years 1994-1995. Funding from the Federal government to the public institutions in the top 100 totaled $107.6 million for the 1994-1995 fiscal years. For the previous two fiscal years, Federal funding totaled $233 million in constant dollars. Funding from the Federal government to the other doctorate-granting universities declined from $113.2 million in 1992-1993 to $4.9 million in 1994-1995. Although relatively low compared to both groups of doctorate-granting institutions, Federal funding for the construction of S&E facilities at nondoctorate-granting institutions also declined, from $6.2 million in fiscal years 1992-1993, to $3 million in 1994-1995.

State and local governments were the largest single source of funding for the construction of S&E research facilities in fiscal years 1994-1995, for all three types of public institutions. Public institutions in the top 100 received $612.9 million from state and local governments (representing approximately half of all construction funds). The public, other doctorate-granting institutions received $261.1 million from this source (75 percent of all construction funds). The public, nondoctorate-granting institutions received virtually all of their construction funds from state and local governments ($290.5 million, or 99 percent of all funding).

The proportion of funding derived from state and local governments to construct S&E research space also increased dramatically for both the public, other doctorate-granting institutions and the nondoctorate-granting institutions. For the 1990-1991 fiscal years, state and local governments provided 41 percent of the funding of S&E facilities for public, other doctorate-granting institutions. For the next two fiscal years, this percentage increased to 60, and for 1994-1995, to 75. For the 1990-1991 fiscal years, state and local government provided only 8 percent of the construction funding to the nondoctorate-granting institutions. Funding increased to 87 percent for the next two fiscal years, and then to 99 percent in fiscal years 1994-1995.

Tax-exempt bonds were the second largest source (22 percent) of funding for construction projects at the public institutions in the top 100 for fiscal years 1994-1995. Other public, doctorate-granting institutions derived only 9 percent of their funding from tax exempt bonds during that period, and the nondoctorate-granting institutions derived no funds whatsoever from that source. Institutional funds, which provided 11 percent of the construction funding for the public universities in the top 100 in 1994-1995, contributed only 3 percent of the total funding for such projects in the public, other doctorate-granting institutions, and less than 1 percent of the funding at nondoctorate-granting institutions.

How Did Private Institutions Fund the Construction of S&E Research Space?

Private, research-performing institutions funded the construction of S&E research facilities differently than did public institutions. Unlike public colleges and universities, private institutions received very little funding from state and local governments for these projects. For the 1994-1995 fiscal years, private institutions in the top 100 received $9.1 million from state and local governments, only 1 percent of all construction funding. Other, doctorate-granting institutions received $7.2 million (9 percent) of their total S&E construction funding from state and local governments. Private, nondoctorate-granting institutions did not receive any money from state and local sources in fiscal years 1994-1995 (Table 5-4 and Figure 5-2).

Table 5-4. Trends in the sources of funding for construction of science and engineering (S&E) research facilities at private institutions: 1990-1995 (constant 1995 dollars in millions)[1]

Private Institutions	Dollar contribution							
	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt Bonds	Other Debt	Other Sources
Top 100								
1990-1991	$756.2	$44.6	$164.6	$218.4	$56.0	$211.9	$31.1	$29.5
1992-1993	628.1	3.9	37.1	136.4	172.5	203.4	24.5	50.2
1994-1995	775.6	87.9	9.1	154.2	290.1	105.5	128.8	0.0
Other doctorate-granting								
1990-1991	303.8	49.4	1.0	16.8	79.6	157.0	0.0	0.0
1992-1993	225.7	138.9	5.0	19.9	17.5	44.4	0.0	0.0
1994-1995	83.3	0.9	7.2	65.9	5.9	0.0	3.4	0.0
Nondoctorate-granting								
1990-1991	16.5	5.7	0.0	5.2	4.2	1.4	0.0	0.0
1992-1993	6.3	1.4	0.0	4.2	0.3	0.3	0.0	0.0
1994-1995	36.3	2.2	0.0	16.0	3.6	14.5	0.0	0.0

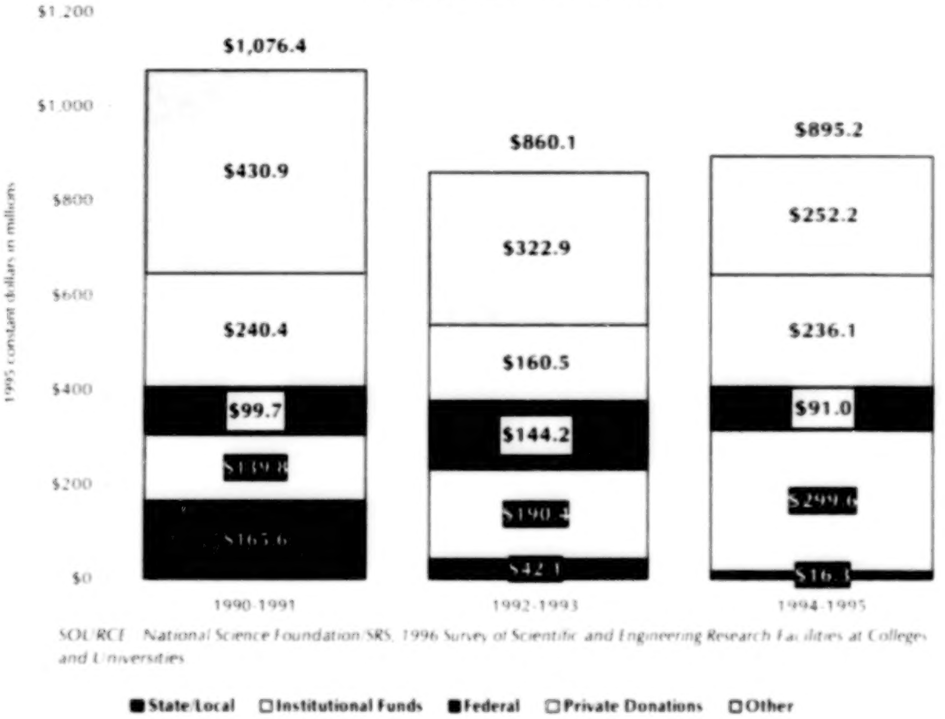
Private Institutions	Relative contribution							
	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt Bonds	Other Debt	Other Sources
Top 100								
1990-1991	100%	6%	22%	29%	7%	28%	4%	4%
1992-1993	100	1	6	22	27	32	4	8
1994-1995	100	11	1	20	37	14	17	0
Other doctorate-granting								
1990-1991	100	16	0	6	26	52	0	0
1992-1993	100	62	2	9	8	20	0	0
1994-1995	100	1	9	79	7	0	4	0
Nondoctorate-granting								
1990-1991	100	34	0	31	26	9	0	0
1992-1993	100	22	0	67	5	5	0	0
1994-1995	100	6	0	44	10	40	0	0

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

NOTE: Percentages may not total to 100 due to rounding.

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Figure 5-2. Trends in the Sources of Funding for S&E Research Construction Projects at Private Institutions: 1990-1995



SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities*

For the 1994-1995 fiscal years, the single largest source of funding for the construction of S&E facilities at private institutions in the top 100 was institutional funds--funds that provided 37 percent of all S&E construction funding. For private, other doctorate-granting institutions, 79 percent of all S&E construction funding came from private donations. Similarly, private donations were the source providing the largest single share of funding to private, nondoctorate-granting institutions. Private donations, in fact, comprised 44 percent of all construction funding at those institutions.

Federal funding for S&E construction projects at the private institutions in the top 100 was higher for fiscal years 1994-1995 than for either of the other two fiscal years examined. In 1994-1995, the Federal government provided these institutions with $87.9 million for projects, a dramatic increase over the $3.9 million provided for the 1992-1993 fiscal years. At private, other doctorate-granting institutions, Federal funding dropped from $138.9 million in the 1993-1994 fiscal years to $.9 million over the next two fiscal years--a decline from 62 to 1 percent of the relative contribution. Private, nondoctorate-granting institutions experienced a slight increase in Federal funds for the construction of S&E research facilities between fiscal years 1992-1993 and 1994-1995, from $1.4 million to $2.2 million. However, in relative terms, due to large increases in funding from private donations and tax exempt bonds, the overall percentage contributed by the Federal government declined from 22 to 6 percent.

How Did Public Institutions Fund the Repair/Renovation of S&E Research Space?

For fiscal years 1994-1995, state and local government was the single largest source of funding for the repair/renovation of S&E research projects in all three types of institutions. In the public institutions in the top 100, state and local government provided $177.9 million to repair/renovate existing S&E research space; this equaled over half (51 percent) of all repair/renovation expenditures during fiscal years 1994-1995. State and local government provided public, other doctorate-granting institutions with $44.4 million during those years (44 percent of all such funding). Public, nondoctorate-granting institutions received $32.1 million from state and local governments (70 percent of all repair/renovation funding) (Table 5-5).

Table 5-5. Trends in the sources of funding for repair/renovation of science and engineering (S&E) research facilities at public institutions: 1990-1995
(constant 1995 dollars in millions)[1]

	Dollar contribution							
Public Institutions	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt Bonds	Other Debt	Other Sources
Top 100								
1990-1991	$369.7	$14.6	$161.7	$49.3	$131.4	$12.0	$0.0	$0.7
1992-1993	429.4	13.6	174.0	26.6	144.3	56.3	1.7	12.8
1994-1995	348.5	23.4	177.9	6.6	120.1	14.3	0.9	5.3
Other doctorate-granting								
1990-1991	116.0	12.4	83.5	0.0	18.5	1.6	0.0	0.0
1992-1993	119.6	20.1	73.0	0.3	21.9	4.0	0.0	0.1
1994-1995	101.3	8.4	44.4	9.1	34.2	4.0	0.0	1.2
Nondoctorate-granting								
1990-1991	20.3	0.8	17.8	0.0	1.7	0.0	0.0	0.0
1992-1993	13.4	3.5	9.3	0.0	0.6	0.0	0.0	0.0
1994-1995	45.9	7.1	32.1	0.2	6.5	0.0	0.0	0.0

	Relative contribution							
Public Institutions	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt Bonds	Other Debt	Other Sources
Top 100								
1990-1991	100%	4%	44%	13%	36%	3%	0%	0%
1992-1993	100	3	41	6	34	13	0	3
1994-1995	100	7	51	2	34	4	0	2
Other doctorate granting								
1990-1991	100	11	72	0	16	1	0	0
1992-1993	100	17	61	0	18	3	0	0
1994-1995	100	8	44	9	34	4	0	1
Nondoctorate-granting								
1990-1991	100	4	88	0	8	0	0	0
1992-1993	100	26	69	0	5	0	0	0
1994-1995	100	15	70	0	14	0	0	0

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction

NOTE: Percentages may not total to 100 due to rounding

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities*

For the public, doctorate-granting institutions (both the top 100 and other doctorate-granting), institutional funds comprised the second largest source of funding for the repair/renovation of S&E research space for fiscal years 1994-1995. In both types of institutions, those funds accounted for 34 percent of the total.

How Did Private Institutions Fund the Repair/Renovation of S&E Research Space?

Between fiscal years 1992-1993 and 1994-1995, funding of S&E repair/renovation projects in private, research-performing institutions increased in all three types of institutions. This was not the case for the public institutions. Across the two time periods, the funding of S&E repair/renovation projects in private institutions in the top 100 increased from $243.8 million to $406.2 million. In private, other doctorate-granting institutions, funding increased from $74.8 million to $125.2 million. Funding for projects in private, nondoctorate-granting institutions increased from $21.6 million to $30.9 million (Table 5-6).

The private, doctorate-granting institutions--both the top 100 and other doctorate-granting--relied primarily on institutional funds to finance the repair/renovation of S&E research space in fiscal years 1994-1995. Fifty-one percent of the total S&E funding for the private institutions in the top 100 came from institutional funds in that time period, equaling $208.1 million. Almost half (49 percent) of the funding to repair/renovate S&E research space at the private, other doctorate-granting institutions was derived from institutional funds.

Only 10 percent of the funding of S&E repair/renovation projects at private, nondoctorate-granting institutions came from institutional funds for fiscal years 1994-1995. Private donations totaling $16.8 million accounted for 54 percent of all repair/renovation funding at private, nondoctorate-granting institutions.

Table 5-6. Trends in the sources of funding for repair/renovation of science and engineering (S&E) research facilities at private institutions: 1990-1995 (constant 1995 dollars in millions)[1]

	Dollar contribution							
Private Institutions	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt Bonds	Other Debt	Other Sources
Top 100								
1990-1991	$343.0	$21.7	$10.6	$52.9	$191.6	$54.9	$9.0	$2.0
1992-1993	243.8	12.4	8.3	39.3	131.2	20.8	27.2	4.5
1994-1995	406.2	29.6	10.5	70.6	208.1	23.6	63.1	0.7
Other doctorate-granting								
1990-1991	65.6	5.7	0.1	7.4	48.9	2.6	0.0	0.8
1992-1993	74.8	5.0	7.9	4.9	53.1	3.9	0.0	0.0
1994-1995	125.2	40.5	0.2	7.4	60.8	2.0	12.2	2.1
Nondoctorate-granting								
1990-1991	15.3	0.0	0.0	3.6	8.1	3.7	0.0	0.0
1992-1993	21.6	6.1	0.0	7.4	6.3	1.7	0.0	0.0
1994-1995	30.9	1.6	0.5	16.8	3.0	6.6	2.4	0.0

	Relative contribution							
Private Institutions	All sources	Federal	State/ Local	Private Donations	Institutional Funds	Tax Exempt Bonds	Other Debt	Other Sources
Top 100								
1990-1991	100%	6%	3%	15%	56%	16%	3%	1%
1992-1993	100	5	3	16	54	9	11	2
1994-1995	100	7	3	17	51	6	16	0
Other doctorate-granting								
1990-1991	100	9	0	11	74	4	0	1
1992-1993	100	7	11	7	71	5	0	0
1994-1995	100	32	0	6	49	2	10	2
Nondoctorate-granting								
1990-1991	100	0	0	23	53	24	0	0
1992-1993	100	29	0	34	29	8	0	0
1994-1995	100	5	2	54	10	21	8	0

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

NOTE: Percentages may not total to 100 due to rounding.

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities*.

Chapter 6

Deferred Construction and Repair/ Renovation

Highlights . . .

- In 1996, 55 percent of research-performing institutions reported construction or repair/renovation projects that were needed but had to be deferred because funds were not available.
- The cost of these deferred projects was $9.3 billion. Sixty percent of deferred capital project needs were for construction, and 40 percent were for repair/renovation.
- The top 100 research-performing universities accounted for 71 percent of the total deferred costs. Other doctorate-granting institutions accounted for 21 percent of the total deferred costs. Nondoctorate-granting institutions accounted for 8 percent of the total deferred capital project costs.
- Seventy-nine percent ($7.4 billion) of total deferred capital project expenditures were included in institutional plans.
- Between fiscal years 1994 and 1996, deferred capital project costs included in institutional plans increased $1.2 billion, from $6.2 billion to $7.4 billion in constant dollars. The majority of this increase was in deferred repair/renovation costs (an increase of $970 million, compared with an increase of $259 million in deferred construction costs).
- If combined with the conservative estimate of $.7 billion in deferred infrastructure costs that can be attributed to S&E research, the total deferred S&E research facilities and infrastructure needs of colleges and universities totalled $10 billion.

Background

NSF's *Survey of Scientific and Engineering Research Facilities at Colleges and Universities* has provided considerable data on the amount, condition, and capital project activity in our nation's research-performing institutions since 1988. An issue of critical importance to policy makers and an important reason for the legislation mandating NSF's biennial facilities survey is the desire to determine how much more S&E research space colleges and universities need, as well as to determine the costs of repairing/renovating existing S&E research facilities.

This chapter reports on the costs of deferred projects for construction and repair/renovation that are necessary to meet existing S&E research commitments, but that cannot be funded with available resources.

The Survey Questions

The 1996 *Survey of Scientific and Engineering Research Facilities at Colleges and Universities* expanded a question asked for the first time in 1994, in order to determine construction and repair/renovation costs that institutions had deferred. The earlier effort requested information only about deferred capital projects that were included in an approved institutional plan. In 1996, institutions reported separately the construction and repair/renovation costs for projects included in such plans, as well as for projects not included.

Four criteria were used to define deferred projects (see Item 7 of the survey in Appendix C):

- The project must be necessary to meet the current S&E research program commitments;
- The project was not scheduled for fiscal year 1996 or 1997;
- The project was not funded; and
- The project was neither for the purpose of developing new programs nor for expanding faculty beyond what is required to fulfill current S&E research program commitments.

Institutions also were asked to report their deferred central campus infrastructure construction and repair/renovation needs. These deferred needs were defined using the same criteria as for facilities, and institutions were asked to report separately those in institutional plans and those not in plans. Central campus infrastructure was defined as those systems that exist between the buildings of a campus and the nonarchitectural elements of campus design. Examples included central wiring for telecommunications systems, waste storage and disposal facilities, electrical wiring between buildings, central heating and air exchange systems, drains, sewers, roadways, walkways and parking systems. Plumbing, lighting, wiring, air exchange systems and the like that exist within a building or within five feet of the building foundation were considered building infrastructure and were excluded from this definition of central campus infrastructure.

Data Considerations

The concept of need, particularly its application to S&E research space, is complex to define and measure. To attain consistency, the questions tie the notion of need to a defined boundary. Without such a boundary, a measurement of need readily becomes a measurement of hopes and wishes.

The term "research program commitments" forces respondents to consider only those R&D activities that are budgeted, approved, and funded, which precludes institutions from indicating they need space in a field within which they do not currently have a research program. The boundaries placed upon these definitions of need intentionally produce conservative estimates, rather than unbounded and untested wish lists.

In the 1994 survey, only 40 percent of all institutions indicated that they had an approved institutional plan that included deferred space. There was concern that the requirement for an approved institutional plan might have been too restrictive by excluding institutions which had real facilities needs but lacked an institutional plan. In 1996, all institutions were eligible to respond to the question on deferred needs regardless of whether they had an approved institutional plan. As a result, 55 percent of institutions indicated deferred needs for either construction or repair or renovation, allowing a more inclusive estimate than was available in 1994. Eleven percent of all institutions reported only needs that were not part of an institutional plan, presumably because a plan did not exist.

Findings

To What Extent Did Colleges and Universities Have Deferred Capital Projects for S&E Research Facilities?

In 1996, 55 percent of research-performing institutions reported construction or repair/renovation projects that were needed but had to be deferred because funds were not available. Eighty percent of these institutions had included these deferred projects in an approved institutional plan. Forty-five percent of the colleges and universities that reported deferred projects also identified projects that were not included in an approved institutional plan.

The total estimated cost for deferred S&E research construction and repair/renovation projects in 1996 was $9.3 billion. This total includes both projects that were in institutional plans and those that were not (Table 6-1).

Table 6-1. Expenditures for deferred capital projects to construct or repair/renovate science and engineering (S&E) research facilities by institution type, type of project, and whether project was included in institutional plans (dollars in millions)

Institution type	*Included in Institutional Plans*		*Not Included in Institutional Plans*		*Total*
	To construct new S&E research facilities	*To repair/renovate existing S&E research facilities*	*To construct new S&E research facilities*	*To repair/renovate existing S&E research facilities*	
Total	$4,629	$2,790	$1,046	$876	$9,341
Doctorate-granting	4,307	2,495	1,004	763	8,569
Top 100 in research expenditures	3,480	1,653	904	601	6,638
Other	827	842	101	162	1,932
Nondoctorate-granting	322	295	42	113	772

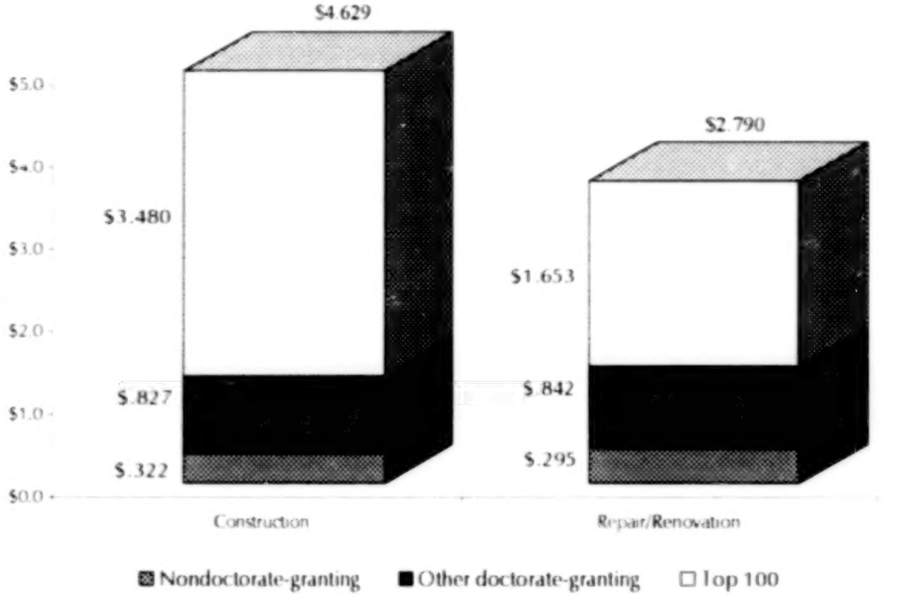
SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Over three-quarters of the total deferred capital project expenditures reported by institutions (79 percent or $7.4 billion) were included in institutional plans. While it is reasonable to suppose that the top 100 institutions would be more likely than other kinds of institutions to have extensive plans identifying deferred needs, this was not the case. Seventy-seven percent of all deferred capital project needs among top 100 institutions were identified in approved institutional plans ($3.5 billion + $1.7 billion divided by $4.6 billion). By contrast, 86 percent of the deferred capital project needs of other doctorate-granting institutions and 80 percent of nondoctorate-granting institutions' deferred capital project needs were part of institutional plans. Deferred construction project costs were more likely than deferred repair/renovation project costs to be part of overall institutional plans. Eighty-two percent of all deferred construction costs were part of institutional plans, compared with 76 percent of all repair/renovation costs.

Overall, 60 percent of all deferred capital project needs (both those included in institutional plans and those not included) were for construction ($4.6 billion + $1.0 billion divided by $9.3 billion). Top 100 institutions had greater deferred construction needs than repair/renovation needs ($4.4 billion versus $2.3 billion). For both the other doctorate-granting universities and the nondoctorate-granting institutions, deferred repair/renovation needs exceeded deferred construction needs.

The top 100 research-performing universities accounted for 71 percent of the total deferred needs, both those in and not in plans ($6.6 billion divided by $9.3 billion). Other doctorate-granting institutions accounted for 21 percent of the total deferred costs. Nondoctorate-granting institutions accounted for 8 percent of the total deferred capital project costs ($.8 billion divided by $9.3 billion) (Table 6-1).

Figure 6-1. Unfunded Science and Engineering (S&E) Research Facilities Needs Included in Institutional Plans: 1996



SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

How Have Deferred Needs Included in Institutional Plans Changed from 1994?

Between fiscal years 1994 and 1996, deferred capital project costs included in institutional plans increased $1.2 billion, from $6.2 billion to $7.4 billion in constant dollars (Figure 6-1). The majority of this increase was in deferred repair/renovation costs (an increase of $970 million, compared with an increase of $259 million in deferred construction costs).

An increase of this magnitude in deferred project costs in a two-year period raises questions about how institutions assessed their deferred needs, and warrants a more detailed examination of the deferred needs reported by participants in the survey. One hypothesis is that the needs identified in the question did not represent the considered judgments of the institutions, but rather an ephemeral "wish list" of capital projects.

To determine whether this might be the case, the following test of the data was constructed. The institutions were split into three groups: one group wherein deferred construction projects costs increased, one wherein the deferred construction costs remained the same, and one wherein deferred costs decreased (Table 6-2).

Table 6-2. Change in deferred science and engineering (S&E) construction and repair/renovation needs reported in institutional plans: 1994 and 1996

1996/1994 comparison	***Construction***		***Repair/Renovation***	
	Number of Institutions	*Change in aggregate need* [1]	*Number of Institutions*	*Change in aggregate need* [1]
Increased need	84	$2,850	126	$1,833
Constant Need/No Need [2]	372		303	
Decreased Need	104	-2,591	130	-863
Total	560	259	560	970

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

[2] Of the institutions indicating constant need for construction, all but two indicated no need in either survey.

Of institutions indicating constant deferred needs in repair/renovation, all but one indicated no need in either year.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

The deferred construction costs of 84 institutions increased between 1994 and 1996, the costs of 372 institutions remained constant, and the deferred costs of 104 institutions decreased. The increases represented an aggregate increase of $2.85 billion, and the decreases represented an aggregate $2.6 billion reduction in need, for a net increase of $259 million in constant 1995 dollars.

The fact that deferred costs reported by some institutions decreased allows a test of how carefully institutions actually considered their needs in answering questions on deferred projects. If institutions carefully considered their deferred needs in responding to the question, then when they built space or scheduled construction, their needs would be expected to decrease. If, on the other hand, institutions were just reporting "wish lists," deferred project costs might not have much to do with what had recently been constructed. By implication, if there is a strong correlation between recent construction and decreased need, it is plausible that institutions had worked from something like an inventory of needs, and that as projects in an area were completed, needs in that area would be reduced. To test this, institutions were examined whose deferred capital project needs had decreased from the amount they reported in 1994 to the amount they reported in 1996. The size of the decrease was correlated with the amount of space either constructed in 1994-1995 or scheduled for construction in 1996 or 1997, since both of these should reduce reported deferred capital project needs. The correlation was .41, a moderate size correlation.

Apparently, the institutional plans for construction reported in 1996 took into account the amount of construction and construction scheduling that had occurred. By implication, deferred construction needs as reported by institutions represented

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thoughtful judgments about the institutions' actual construction needs and did not appear to be "wish lists" of desired research facility projects.

A similar test was performed using repair/renovation costs, with less clear-cut results. For deferred repair/renovation, 126 institutions' deferred repair/renovations needs increased (representing an aggregate increase of $1.8 billion in deferred repair/renovation), 303 remained constant, and 130 institutions' deferred construction needs decreased (representing an aggregate $863 million reduction of need), with a net increase of deferred repair needs of $970 million in constant 1995 dollars. The amount of scheduled and completed repair/renovation activity was correlated .27 with the amount of decrease in need, a somewhat weaker correlation than was found for construction.

A case-by-case examination of the data suggested that when substantial repair activity occurred, the amount of repair reported as deferred decreased by more than the amount of the repair. It may be that some of the deferred repairs were redefined as need for construction, when the extent of repairs required became more evident. In any case, the judgment of deferred repair/renovation need seems to involve both: (1) assessing the amount of repairs needed and subtracting the amount of repairs completed or scheduled; and (2) making judgments about the balance of the deferred repair needs and how they should be handled.

A second hypothesis that could explain why construction and repair/renovation planned needs increased from 1994 to 1996 would be that institutions were more likely to report having institutional plans in 1996 than in 1994. In the aggregate, this does not appear to be the case for construction planning; 142 institutions reported deferred plans for construction in institutional plans in 1994, compared with 131 in 1996 (a decrease of 11). There was not a perfect overlap between the two years. Sixty percent of the institutions reporting construction plans in 1994 also reported plans in 1996, but 11 percent of institutions not reporting construction plans in 1994 did report them in 1996.

Table 6-3 shows differences between years in reporting of construction and repair/renovation deferred needs. The average cost of deferred construction needs of those reporting in 1994, but not in 1996, was a bit smaller than those reporting in 1996, but not in 1994 ($22 million versus $26 million). However, the number of institutions reporting deferred construction needs in institutional plans was somewhat larger (57 versus 46), so that the aggregate need was roughly constant ($1.2 billion). Therefore, the net increase of $259 million in deferred construction in constant 1995 dollars came mainly from those reporting deferred construction plans in both years (because the average sizes of their plans increased from $37 million to $41 million).

Table 6-3. Consistency in reporting deferred construction and repair/renovation needs: 1994 and 1996
(in millions)

CONSTRUCTION

Need in 1994 Plan	*Need in 1996 Plan*	*Number of Institutions*	*1994 Cost of Deferred Need* [1]	*Average 1994 Cost of Deferred Need* [1]	*1996 Cost of Deferred Need*	*Average 1996 Cost of Deferred Need*
No	No	372	-	-	-	-
Yes	No	57	$1,265	$22	-	-
No	Yes	46	-	-	$1,183	$26
Yes	Yes	85	3,105	37	3,447	41
Total		560	4,370		4,630	

REPAIR/RENOVATION

Need in 1994 Plan	*Need in 1996 Plan*	*Number of Institutions*	*1994 Cost of Deferred Need* [1]	*Average 1994 Cost of Deferred Need* [1]	*1996 Cost of Deferred Need*	*Average 1996 Cost of Deferred Need*
No	No	303	-	-	-	-
Yes	No	56	$355	$6	-	-
No	Yes	90	-	-	$1,184	$13
Yes	Yes	111	1,465	13	1,606	14
Total		560	1,820		2,790	

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

The average cost of deferred repair/renovation projects did not change much ($14 million versus $13 million) between 1994 and 1996 for institutions reporting in both years. Therefore, to account for the increase in deferred repair/renovation projects, attention should be focused on institutions reporting in one year and not the other. This examination yields two observations: (1) more institutions reported deferred repair/renovation projects in 1996 than in 1994; and (2) the average amounts per institution reported were much larger in 1996 than in 1994. Thirty-four more institutions reported deferred repair/renovation projects in 1996 than in 1994 (201 versus 167). The institutions reporting deferred repair needs for the first time in 1996 reported much larger deferred repair needs than those who reported in 1994 but not in 1996 (an average deferred need of $13 million per institution compared with $6 million). Thus, a larger number of institutions reported larger deferred projects accounts for the large increase in planned repair/renovation.

In sum, then, there is good reason to believe that deferred needs for capital projects included in institutional plans actually increased from 1994 to 1996 by nearly $1.7 billion. Most of this increase was due to increased needs for repair/renovation ($1.1 billion). This increase in repair/renovation deferred needs was due to an increased number of institutions identifying larger deferred needs on the average. The smaller increase in deferred construction needs ($.6 billion) was largely accounted for by the increasing scope of existing deferred construction projects among roughly the same institutions in 1996 as in 1994.

Since estimating the costs of deferred projects is of great policy relevance, an alternative method of estimating unfunded construction and repair/renovation needs was tested to determine whether it yielded an estimate consistent with this estimate of $9.3 billion. That approach relied on institutional estimates of how much additional space was needed in each field and what proportion of the space in the field required repair/renovation. This alternative, described in Appendix E, yielded an estimate ($8.0 billion) in fair accord with the current method. This convergent validation provides additional assurance that the estimate of $9.3 billion in unfunded need for construction and repair/renovation of S&E research space is a reliable one.

To What Extent Did Colleges and Universities Have Deferred Capital Projects for the Central Campus Infrastructure?

The facilities in which S&E research is conducted are supported by a campus infrastructure of walkways and roads, wiring for telecommunications and electricity, sewers and drains, air handling, waste storage and disposal and the like. It is difficult to establish how much of this central campus infrastructure supports the work of S&E research compared with other academic or residential needs. As noted in Chapter 1, 56 percent of all academic space is devoted to S&E, and nearly half of that space (48 percent) is for S&E research. There is concern that central campus infrastructures are not adequate to meet S&E research burdens on them.

In 1996, research-performing institutions reported deferred construction and repair/renovation costs affecting their central campus infrastructure. The estimated costs for these projects, both those included in institutional plans and those that were not, totaled $2.5 billion (Table 6-4).

Table 6-4. Expenditures for deferred capital projects to construct or repair/renovate central campus infrastructure by institution type, type of project and whether project was included in institutional plans (in millions of dollars)

Institution type	*Included in Institutional Plans*		*Not Included in Institutional Plans*		*Total*
	To construct new central campus infrastructure	*To repair/renovate existing central campus infrastructure*	*To construct new central campus infrastructure*	*To repair/renovate existing central campus infrastructure*	
Total	761	897	171	625	2,454
Doctorate-granting	738	814	170	623	2,345
Top 100 in research expenditures	538	729	155	491	1,913
Other	200	85	15	132	432
Nondoctorate-granting	23	83	1	2	109

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Approximately two-thirds of the total deferred cost to either construct or repair/renovate the central campus infrastructure (68 percent) was included in institutional plans ($761 million + $897 million divided by $2.5 billion). Almost all of the deferred central campus infrastructure costs estimated by the nondoctorate-granting institutions (97 percent, or $23 million + $83 million divided by $109 million) were included in institutional plans.

It should be noted that this $2.5 billion in deferred central campus infrastructure costs is in addition to the $9.3 billion identified above. Since 56 percent of all academic space is devoted to S&E, and 48 percent of that space is research space, a conservative estimate of S&E research needs for central campus infrastructure might be calculated as $.7 billion ($2.5 billion x .56 x .48). It should be recognized that (1) S&E research is probably more demanding of central campus infrastructure than other space, and (2) it is more difficult to prorate infrastructure costs than research facilities costs. Thus, $.7 billion is a very conservative estimate of the S&E research infrastructure deferred project costs.

Combining this $.7 billion with the $9.3 billion in deferred S&E research capital projects estimated above, the total deferred S&E research facilities and infrastructure needs of colleges and universities totalled $10 billion.

Chapter 7

Historically Black Colleges and Universities

Highlights . . .

- In 1996, the 68 research-performing Historically Black Colleges and Universities (HBCUs) contained 9 million net assignable square feet (NASF) of science and engineering (S&E) space. Slightly over a quarter of this space, 2.4 million NASF or 26 percent, was considered to be research space.
- Ninety-seven percent of the research-performing HBCUs reported research space in the biological sciences outside of medical schools and 79 percent had S&E research space in the physical sciences.
- The construction of S&E research space in HBCUs has declined steadily since fiscal years 1990-1991, from $42.5 million to $21.3 million in fiscal years 1994-1995.
- Expenditures for repair/renovation fluctuated since fiscal years 1990-1991, decreasing from $24.2 million in 1990-1991 to $9.6 million in 1992-1993, and then increasing to $22 million in 1994-1995.
- All research-performing HBCUs reported a need for 753,103 additional NASF of S&E research space, only 22 percent of which was scheduled for construction in fiscal year 1996 or 1997.
- The HBCUs reported that 328,382 NASF of S&E research space needed major renovation or replacement, of which 13 percent was scheduled in fiscal year 1996 or 1997.
- HBCUs reported a total of $302 million in S&E capital projects that were needed but had to be deferred because there was not sufficient funding available.

Background

For over a century, HBCUs have played an important role in the higher education of black students. In the fall of 1993, over 282,000 students attended the 107 colleges and universities considered HBCUs by the U.S. Department of Education.

Many of the HBCUs are relatively small institutions, with considerably less research space than other research-performing institutions. Given budget constraints in recent years, the construction of S&E research space has been limited. Yet, HBCUs are important to the production of black scientists and engineers. Although they enroll only 17 percent of all black college students nationwide, HBCUs awarded 44 percent of all bachelor's degrees in the sciences that went to black students in 1990 (*Academe*, January/February 1995).

This chapter profiles S&E research facilities at the research-performing HBCUs; and examines the amount of S&E space, its adequacy and condition, capital project activity, funding sources, and the need for additional or renovated space.

The Survey Questions

The profile of research facilities in HBCUs presented in this chapter is based upon all survey questions examined in previous chapters.

Data Considerations

The National Advisory Committee on Black Higher Education and Black Colleges and Universities identified 107 HBCUs.[1] Of this group, 29 reported separately budgeted research expenditures in 1988, the year in which the first, full-scale facilities survey was conducted by NSF. All of these institutions were included in the 1988 sample and in subsequent samples. In 1992, NSF identified an additional 41 HBCUs that had separately budgeted research and development (R&D)

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[1] The National Center for Education Statistics (NCES) and NSF both used the list developed by the White House Initiative on Historically Black Colleges and Universities to identify HBCUs. The discrepancy in the numbers of HBCUs reported by NCES (105) and NSF (107) results from differences in the way multi-campus institutions were counted. NSF counted each campus of multi-campus institutions as a separate unit; NCES considered multi-campus institutions as single entities.

expenditures. In 1992, the survey sample included the original panel of 29 institutions, and the additional 41, for a total of 70 research-performing HBCUs. Two HBCUs, however, did not have R&D expenditures in 1994 or 1996, resulting in a total of 68 research-performing HBCUs for those two years.

As a result of these additional HBCUs, two sets of estimates can be provided. Previous reports have focused on the original panel of 29 HBCUs. This report breaks from that tradition and presents data on the larger group of HBCUs, from 1992 to 1996. Trends in results based on the panel of 29 HBCUs (from 1988) can be found in tables presented in Appendix F, "Detailed Statistical Tables."

The reader also should keep in mind an important difference between the HBCUs profiled in this chapter and the research-performing colleges and universities discussed in the previous six chapters. HBCUs with any R&D expenditures are included in the sampling universe. The criterion for all other colleges and universities is more restrictive; they must have R&D expenditures of $50,000 or more. Many of the HBCUs discussed in this chapter, then, are predominantly teaching institutions with limited research needs.

Findings

How Much Research Space Did HBCUs Have?

The 68 research-performing HBCUs contained 9.0 million NASF of S&E space in 1996. Slightly over a quarter of this space (2.4 million NASF or 26 percent) was considered to be research space (Table 7-1).

The total amount of S&E space in research-performing HBCUs has fluctuated somewhat since 1992. In that year, HBCUs reported a total of 9.1 million NASF of S&E space. Two years later, those same institutions reported 7.9 million NASF. In 1996, the HBCUs reported 9.0 million NASF of S&E space, an amount close to that reported four years earlier.

Table 7-1. Trends in the amount of space assigned to science and engineering (S&E) fields at Historically Black Colleges and Universities: 1992-1996
(Net assignable square feet in millions)

Index	*1992*	*1994*	*1996*
Total S&E space	9.1	7.9	9.0
S&E research space	2.9	2.2	2.4
S&E research space as a percentage of space	32%	28%	26%

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

The S&E research space also has shifted since 1992, from 2.9 million NASF in that year, to 2.2 million NASF in 1994, to 2.4 million in 1996. S&E research space has declined steadily, from 32 percent to 28 percent to 26 percent in the same three time periods.

In What Fields Did HBCUs Have S&E Research Space?

Like other research-performing colleges and universities, HBCUs were most likely to have S&E research space in the biological sciences outside of medical schools and in the physical sciences. In 1996, 97 percent of the research-performing HBCUs reported they had S&E research space in the biological sciences outside of medical schools. Seventy-nine percent of the HBCUs indicated that they had S&E research space in the physical sciences (Table 7-2).

Compared to all research-performing institutions, the HBCUs were less likely than others in that category to have S&E research space in all fields (excepting the biological sciences outside of medical schools and the agricultural sciences). When compared to nondoctorate-granting institutions (the group most similar to the HBCUs in composition), the HBCUs were less likely to have S&E research space in all fields except the biological sciences outside of medical schools, the agricultural sciences, and mathematics (compare Table 7-2 with Table 1-5).

Table 7-2. Trends in the percentage of Historically Black Colleges and Universities with science and engineering (S&E) research space and the amount of S&E research space by field: 1992-1996

	Percentage with research space			*Amount of research space (NASF in thousands)*		
Field	***1992***	***1994***	***1996***	***1992***	***1994***	***1996***
Biological sciences--outside medical schools	93%	83%	97%	1,137	480	393
Physical sciences	72	70	79	275	280	352
Psychology	27	40	49	25	33	31
Social sciences	46	45	56	78	61	77
Mathematics	44	43	54	34	36	44
Computer sciences	36	37	49	53	52	64
Earth, atmospheric, and ocean sciences	29	16	22	64	36	54
Engineering	24	28	29	302	355	364
Agricultural sciences	27	24	26	497	483	595
Medical sciences--outside medical schools	26	28	26	147	141	77
Biological sciences--medical schools	3	4	4	121	159	150
Medical sciences--medical schools	5	4	4	187	69	84

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

In 1996, the agricultural sciences dominated the S&E research space, with 595,000 NASF. Similar to other research-performing institutions, the amount of S&E research space in the agricultural sciences was disproportionate to the number of HBCUs that had space in that field; only 26 percent had S&E research space in the agricultural sciences in 1996. The biological sciences outside of medical schools had 393,000 NASF of S&E research space in that same year. Over time, however, the amount of S&E research space in the biological sciences outside of medical schools declined, from 1.1 million NASF in 1992, to 480,000 in 1994, to 393,000 in the most current period. Medical science S&E research space outside of medical schools also declined, from 147,000 NASF in 1992, to 77,000 in 1996 (Table 7-2).

Fields in which S&E research space in HBCUs increased at least 20,000 NASF between 1992 and 1996 include the physical sciences, from 275,000 NASF in 1992, to 352,000 in 1996; engineering, from 302,000 NASF to 364,000 NASF in that time period; and agricultural sciences, from 497,000 to 595,000 NASF.

Did the HBCUs Consider the Amount of S&E Research Space to be Adequate?

In 1996, as in 1994, HBCUs were more likely to report that space in the computer sciences was inadequate than in other S&E fields (Table 7-3). Fifty-seven percent of all HBCUs with S&E research space in the computer sciences indicated in 1996 that the amount of space was inadequate. This percentage declined from 1994, when 79 percent of all HBCUs indicated inadequate space. It should be noted that S&E research space in the computer sciences increased between 1994 and 1996, from 52,000 NASF to 64,000 NASF (Table 7-2).

Table 7-3. Trends in the percentage of Historically Black Colleges and Universities reporting inadequate amounts of science and engineering (S&E) research space in existing fields: 1992-1996

Field	*1992*	*1994*	*1996*
Biological sciences--outside medical schools	39%	44%	50%
Physical sciences	50	49	45
Psychology	68	77	48
Social sciences	41	43	42
Mathematics	45	68	30
Computer sciences	44	79	57
Earth, atmospheric, and ocean sciences	49	45	34
Engineering	36	53	56
Agricultural sciences	37	25	39
Medical sciences--outside medical schools	50	53	28
Biological sciences--medical schools	0	0	0
Medical sciences--medical schools	30	33	33

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

At least half of the HBCUs reported in 1996 an inadequate amount of S&E research space in engineering (56 percent) and in the biological sciences outside of medical schools (50 percent). Interestingly, the amount of engineering S&E research space increased steadily from 1992, from 302,000 NASF to 364,000 NASF four years later. Biological research space declined dramatically, however, as noted above.

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What Was the Condition of Research Space in the HBCUs?

In 1996, 14 percent of the S&E research space in the HBCUs was evaluated as "...requires major renovation or replacement to be used effectively." This amounted to 336,000 NASF. In 1994, 16 percent of the research space, or 352,000 NASF, was evaluated in the same way. Only 8 percent of the S&E research space (232,000 NASF) was thought to require major renovation or replacement in 1992 (Table 7-4).

Table 7-4. Trends in the percentage and amount of science and engineering (S&E) research space in Historically Black Colleges and Universities considered to require major renovation or replacement: 1992-1996

Requires major renovation or replacement	*1992*	*1994*	*1996*
Percentage of space	8%	16%	14%
NASF in thousands	232	352	336

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

How Much Construction and Repair of S&E Research Space Have HBCUs Undertaken?

Since 1990-1991, the amount spent to construct S&E research space at the research-performing HBCUs has declined dramatically, from $42.5 million in 1995 constant dollars to $21.3 million in fiscal years 1994-1995. The fields in which HBCUs constructed space varied from year to year. In 1992-1993, for example, the majority of construction (71 percent) occurred in the biological sciences. In fiscal years 1994-1995, the earth, atmospheric, and ocean sciences dominated the construction of S&E research space in HBCUs, with $14.5 million. In the two previous fiscal years, only $1.8 million was spent to construct space in that field (Table 7-5 and Figure 7-1).

Table 7-5. Trends in the construction of science and engineering (S&E) research projects at Historically Black Universities and Colleges by field: 1990-1995 (constant 1995 dollars in thousands)[1]

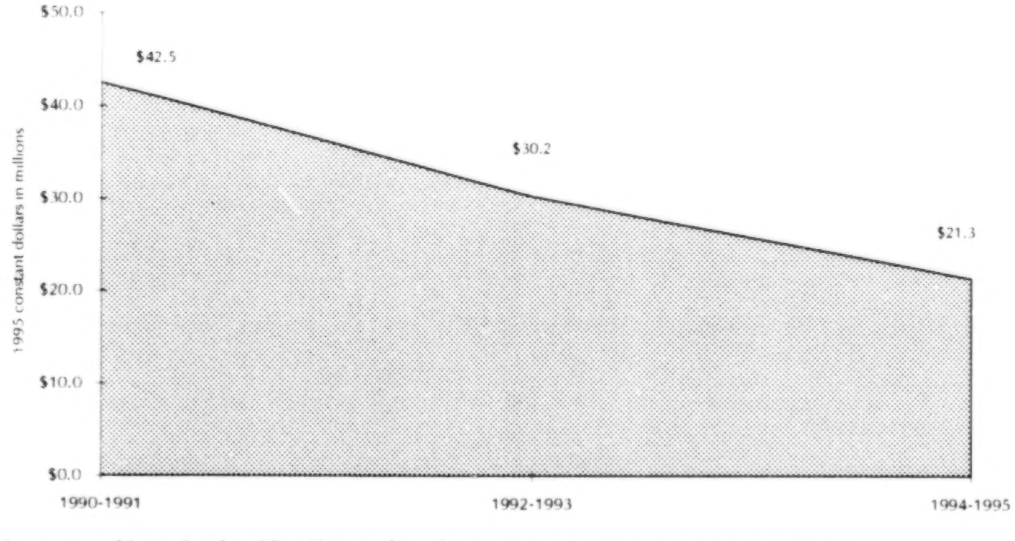
Field	1990-1991	1992-1993	1994-1995
Total	$42,482	$30,220	$21,346
Biological sciences, outside medical schools	7,884	20,870	685
Physical sciences	6,184	1,126	0
Psychology	406	0	0
Social sciences	*	0	2,000
Mathematics	3,554	0	0
Computer sciences	0	0	0
Earth, atmospheric, and ocean sciences	2,615	1,845	14,464
Engineering	0	2,100	0
Agricultural sciences	7,263	2,993	4,197
Medical sciences, outside medical schools	9,492	0	0
Biological sciences, medical schools	0	663	0
Medical sciences, medical schools	0	0	0
Other	5,085	625	0

*Combined with psychology in 1992

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Figure 7-1.
Trends in Funding for New Construction at HBCUs



Source: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

In fiscal years 1994-1995, HBCUs spent only slightly more to repair/renovate S&E research space ($22 million) as they did to construct space ($21.3 million). Unlike construction expenditures, repair/renovation expenditures in HBCUs increased from fiscal years 1992-1993, from $9.6 million to $22 million. However, the 1994-1995 repair/renovation expenditures were still lower than those in 1990-1991, when HBCUs spent $24.3 million (Table 7-6).

Table 7-6. Trends in the repair/renovation of science and engineering (S&E) research projects at Historically Black Colleges and Universities by field: 1992-1996 (constant 1995 dollars in thousands)[1]

Field	*1990-1991*	*1992-1993*	*1994-1995*
Total	$24,222	$9,594	$21,959
Biological sciences, outside medical schools	2,963	752	4,643
Physical sciences	11,390	4,159	3,361
Psychology	0	0	0
Social sciences	*	0	882
Mathematics	4,908	557	0
Computer sciences	3,500	293	268
Earth, atmospheric, and ocean sciences	0	105	0
Engineering	0	554	9,551
Agricultural sciences	174	1,691	600
Medical sciences, outside medical schools	362	607	428
Biological sciences, medical schools	0	506	1,700
Medical sciences, medical schools	927	0	171
Other	0	371	353

*Combined with psychology in 1992

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

How Did HBCUs Fund Construction and Repair/Renovation Projects?

Similar to fiscal years 1992-1993, in 1994-1995, HBCUs relied primarily on state and local governments to fund construction projects. In both those years, state and local governments provided more than three-quarters of the total construction funding. In both 1992-1993 and 1994-1995, the Federal government provided 16 percent of construction funding. In fiscal years 1990-1991, however, the Federal government funded 35 percent of construction at HBCUs, and state and local government funded only 48 percent of these projects (Table 7-7).

Table 7-7. Trends in the sources of funding for construction at Historically Black Colleges and Universities: 1990-1995

Source of Funding	*1990-1991*	*1992-1993*	*1994-1995*
Dollar contribution (in millions)[1]			
All sources	$42,632	$30,249	$21,346
Federal government	14,753	4,785	3,342
State/local government	20,424	23,617	16,796
Private donations	0	0	291
Institutional funds	5,269	185	917
Tax exempt bonds	0	0	0
Other debt	0	0	0
Other sources	2,187	1,662	0
Relative contribution			
Federal government	35%	16%	16%
State/local government	48	78	79
Private donations	0	0	1
Institutional funds	12	0.6	4
Tax exempt bonds	0	0	0
Other debt	0	0	0
Other sources	5	5	0

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

In 1992-1993 and 1994-1995, the Federal government provided a much larger percentage of the repair/renovation funding to HBCUs than it did construction funding. In fiscal years 1992-1993, 53 percent of the total repair/renovation funding came from the Federal government, and in fiscal years 1994-1995, 47 percent came from that source. In 1990-1991, only 17 percent of all repair/renovation dollars were provided by the Federal government (Table 7-8).

Table 7-8. Trends in the sources of funding for repair/renovation at Historically Black Colleges and Universities: 1990-1995

Source of Funding	*1990-1991*	*1992-1993*	*1994-1995*
Dollar contribution (in thousands)[1]			
All sources	$24,221	$9,594	$21,959
Federal government	4,012	5,064	10,378
State/local government	19,964	2,185	6,641
Private donations	170	1,825	0
Institutional funds	76	521	2,590
Tax exempt bonds	0	0	0
Other debt	0	0	2,350
Other sources	0	0	0
Relative contribution			
Federal government	17%	53%	47%
State/local government	82	23	30
Private donations	1	19	0
Institutional funds	0	5	12
Tax exempt bonds	0	0	0
Other debt	0	0	11
Other sources	0	0	0

[1] Current dollars have been adjusted to 1995 constant dollars using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Funding from state and local governments for repair/renovation declined dramatically from fiscal years 1990-1991, in dollars as well as proportions. In 1990-1991, state and local governments provided HBCUs with $20 million (82 percent of all funding) to repair/renovate S&E research facilities. Two years later, funding from state and local governments to HBCUs totaled $2.2 million, only 23 percent of all repair/renovation funding.

What are the S&E Facilities Needs of HBCUs?

HBCUs reported a total of $302 million in S&E capital projects that were needed but had to be deferred because there was not sufficient funding available. These included $196 million in projects to construct S&E research space and $106 million to repair/renovate existing S&E research space. Eighty-two percent of the construction needs and 71 percent of the repair/renovation needs had been identified in institutional plans (Table 7-9).

Table 7-9. Expenditures for deferred capital projects to construct or repair/renovate science and engineering (S&E) research facilities at HBCUs by institution type, type of project, and whether project was included in institutional plans (dollars in millions)

Institution type	*Included in Institutional Plans*		*Not Included in Institutional Plans*		*Total*
	To construct new S&E research facilities	*To repair/renovate existing S&E research facilities*	*To construct new S&E research facilities*	*To repair/renovate existing S&E research facilities*	
Total	$160	$75	$36	$31	$302
Doctorate-granting	61	8	1	1	71
Nondoctorate-granting	99	67	35	30	231

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Doctorate-granting HBCUs accounted for 24 percent of all deferred capital project needs, 31 percent of construction needs and 8 percent of repair/renovation needs.

Chapter 8

Nondoctorate-Granting Institutions

Highlights . . .

- Nondoctorate-granting institutions covered in the survey are research-performing institutions that do not grant doctorates. They consist of *liberal arts institutions* (institutions that primarily award bachelor's degrees and that grant more than half their degrees in the liberal arts) and *comprehensive universities* (which offer a liberal arts program along with other programs, such as engineering and business).
- The comprehensive universities accounted for 83 percent of the total S&E space among the nondoctorate-granting institutions in 1996 (23.9 million NASF), and 76 percent of the S&E space designated for research (4.4 million NASF).
- The biological sciences outside medical schools and the physical sciences accounted for half of the S&E research space in the nondoctorate-granting institutions in 1996.
- Eighteen percent of the S&E research space in the nondoctorate-granting institutions (1.1 million NASF) was considered to require major renovation or replacement.
- Comprehensive universities accounted for 89 percent ($294.5 million) of the S&E construction dollars among the nondoctorate-granting institutions in fiscal years 1994-1995.
- Ninety-nine percent of the construction funding for comprehensive universities was provided by state and local governments in fiscal years 1994-1995.
- Nondoctorate-granting institutions reported $772 million in capital projects that were needed but had to be deferred because sufficient funding was not available.

Background

Although the doctorate-granting institutions contain the majority of S&E research space, the nondoctorate-granting institutions play an important role in the S&E enterprise. The significance and visibility of the nondoctorate-granting institutions has increased in recent years, as educators and policy makers recognize their contributions to the production of scientists, engineers, science teachers, and mathematics teachers for our nation's elementary and secondary schools.

Following the 1994 procedure, this chapter uses the 1996 sample to provide insights into several issues regarding S&E research facilities at nondoctorate-granting institutions.

The Survey Questions

The profile of nondoctorate-granting institutions presented in this chapter is based upon all survey questions considered in previous chapters.

Data Considerations

The nondoctorate-granting institutions contribute to S&E research primarily through educating and training students to become either researchers or science and mathematics teachers in elementary and secondary schools. Although considerable research does occur at these institutions, direct research is not their primary contribution. The current NSF facilities survey, designed to collect data on the size, condition, and needs of the nation's research-performing colleges and universities, collects data from a sample of higher education institutions that report research and development (R&D) expenditures of at least $50,000 in S&E fields.

The many colleges and universities that do not report such expenditures are not included in this survey. However, those institutions teach large numbers of students and award degrees in S&E fields to individuals who teach and conduct S&E research. Results from analyses reported in this chapter, however, cannot be generalized to undergraduate institutions that did not report R&D expenditures.

The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities (colleges that offer a liberal arts program along with other programs, such as engineering, business administration, and nursing); and liberal arts colleges (institutions that primarily award bachelor's degrees and that grant more than half their degrees in the liberal arts).[2] The NSF facilities sample includes 54 comprehensive universities that represent 136 institutions, and 26 liberal arts colleges that represent 52 such institutions. In addition, 42 of the Historically Black Colleges and Universities (HBCUs) are classified as comprehensive universities and 16 are classified as liberal arts colleges. Unlike the 1994 report, HBCUs are included, here, with either the comprehensive or liberal arts institutions, and are not presented separately.

Since no medical schools are present among the nondoctorate-granting institutions, in the balance of this chapter, "biological sciences" are referred to without the qualifier "outside of medical schools."

Findings

How Much S&E Research Space Did Nondoctorate-Granting Institutions Have?

In 1996, the nondoctorate-granting institutions contained 29 million NASF of S&E space. A bit less than three-quarters (73 percent) of all nondoctorate-granting institutions were comprehensive universities. The comprehensive universities accounted for 83 percent of the total S&E space among the nondoctorate-granting institutions in 1996 (23.9 million NASF), and 76 percent of the S&E space designated for research (4.4 million NASF). Table 8-1 shows that liberal arts institutions utilized a slightly larger proportion of their S&E space for research than did comprehensive universities (27 percent versus 18 percent). This may be because comprehensive universities support S&E programs and research in many fields, while liberal arts schools tend to support the research of only a few disciplines (Table 8-2).

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[2] This report uses the 1991 classification and not the more recent 1995 classification. This earlier classification was used in the 1994 facilities report and provides some consistency with that effort.

Table 8-1. Distribution of science and engineering (S&E) space at nondoctorate-granting institutions: 1996

	Nondoctorate-granting	*Comprehensive*	*Liberal Arts*
Total S&E space (NASF in millions)	**29**	**23.9**	**5.1**
S&E research space (NASF in millions)	5.8	4.4	1.4
S&E research space as a percentage of total space	20%	18%	27%

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

In What Fields Did Non-Doctorate-Granting Institutions Have S&E Research Space?

Similar to the doctorate-granting universities, nondoctorate-granting institutions were most likely to have S&E research space in the biological sciences and in the physical sciences (Table 8-2). At least 90 percent of all nondoctorate-granting institutions had S&E research space in these two fields. Psychology and the social sciences followed; 71 percent of the nondoctorate-granting institutions had S&E research space in the former, and 63 percent in the latter. Only a third of nondoctorate-granting institutions had S&E research space in engineering, and slightly less than a fifth (19 percent) had S&E research space in the agricultural sciences.

Table 8-2. Percentage of nondoctorate-granting institutions with science and engineering (S&E) research space and the amount of S&E research space by field

Field	Nondoctorate-granting	Comprehensive	Liberal Arts
Percentage with S&E research space			
Biological sciences	92%	92%	92%
Physical sciences	90	90	92
Psychology	71	71	72
Social sciences	63	62	65
Mathematics	50	48	54
Computer sciences	54	56	50
Earth, atmospheric, and ocean sciences	40	38	45
Engineering	33	41	9
Agricultural sciences	19	24	5
Medical sciences, outside medical schools	26	35	0
Amount of S&E research space (NASF in millions)	5.8	4.4	1.4
Biological sciences	1.5	1.0	0.5
Physical sciences	1.4	0.9	0.5
Psychology	0.4	0.3	0.2
Social sciences	0.3	0.3	0.3
Mathematics	0.1	0.1	<.1
Computer sciences	0.2	0.2	<.1
Earth, atmospheric, and ocean sciences	0.3	0.2	<.1
Engineering	0.6	0.6	<.1
Agricultural sciences	0.6	0.6	<.1
Medical sciences, outside medical schools	0.3	0.3	<.1

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

In 1996, the biological sciences and the physical sciences accounted for half of the S&E research space in nondoctorate-granting institutions. In liberal arts colleges, each of these fields occupied .5 million NASF. Together, they accounted for 71 percent of the total 1.4 million NASF of S&E research space at these colleges. Biological and physical sciences accounted for somewhat less (43 percent) of S&E space in comprehensive universities. In part, this is because comprehensive universities were more likely to support research space in engineering (41 percent versus 9 percent), medical sciences outside medical schools (35 percent versus no space), and agriculture (24 percent versus 5 percent).

Did the Nondoctorate-Granting Institutions Consider the Amount of S&E Research Space to be Adequate?

In 1996, over half of the nondoctorate-granting institutions with S&E research space in the biological sciences and in the physical sciences indicated that the amount of space in those fields was inadequate to meet current research commitments. Recalling the discussion of Table 2-1, the proportions of nondoctorate-granting institutions rating space as inadequate by field did not differ dramatically from that reported by doctorate-granting institutions. Comprehensive institutions were more likely to report that S&E research space in the biological sciences was inadequate than in any other field (54 percent rated biology space as inadequate). Liberal arts colleges, on the other hand, were more likely to report that S&E research space in the social sciences was inadequate (72 percent reported that space was inadequate) (Table 8-3).

Table 8-3. Percentage of nondoctorate-granting institutions reporting inadequate amounts of science and engineering (S&E) research space in existing fields

Field	*Nondoctorate-granting*	*Comprehensive*	*Liberal Arts*
Biological sciences	52%	54%	45%
Physical sciences	51	48	59
Psychology	42	37	60
Social sciences	44	33	72
Mathematics	32	35	23
Computer sciences	47	45	50
Earth, atmospheric, and ocean sciences	47	42	59
Engineering	50	48	52
Agricultural sciences	35	38	NA
Medical sciences, outside medical schools	47	47	NA

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

What Was the Condition of S&E Research Space in Nondoctorate-Granting Institutions?

Eighteen percent of the S&E research space (1.1 million NASF) was considered to require major renovation or replacement in the nondoctorate-granting institutions. Recalling Table 2-2, an identical 18 percent of space in doctorate-granting institutions was reported as requiring major renovation or replacement. Nearly equal proportions of the S&E research space in comprehensive universities and liberal arts colleges (19 and 17 percent, respectively) were reported as requiring major renovation or replacement. These percentages represent 836,000 NASF in the comprehensive universities and 238,000 in the liberal arts colleges (Table 8-4).

Table 8-4. Percentage and amount of science and engineering (S&E) research space in nondoctorate-granting institutions considered to require major renovation or replacement: 1996

	Nondoctorate-granting	*Comprehensive*	*Liberal Arts*
Percentage of space	18%	19%	17%
NASF in thousands	1,074	836	238

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

How Much Construction and Repair of S&E Research Space Did Nondoctorate-Granting Institutions Undertake?

The nondoctorate-granting institutions spent $330.6 million to construct S&E research space in fiscal years 1994-1995. Comprehensive universities accounted for 89 percent ($294.5 million) of the S&E construction dollars among the nondoctorate-granting institutions (Table 8-5).

In both the comprehensive universities and the liberal arts colleges, the biological sciences dominated construction activity. For comprehensive universities, $128.6 million of the total $294.5 million was spent to construct S&E research space in the biological sciences. In liberal arts colleges, the biological sciences accounted for 89 percent of all construction dollars ($32 million).

Table 8-5. Expenditures to construct science and engineering (S&E) research space in nondoctorate-granting institutions by field: 1994-1995 (dollars in millions)

Field	Nondoctorate-granting	Comprehensive	Liberal Arts
Total	$330.6	$294.5	$36.1
Biological sciences	160.6	128.6	32.0
Physical sciences	96.8	93.3	3.5
Psychology	0.0	0.0	0.0
Social sciences	0.6	0.6	0.0
Mathematics	0.4	0.4	0.0
Computer sciences	0.0	0.0	0.0
Earth, atmospheric, and ocean sciences	15.2	14.5	0.7
Engineering	0.0	0.0	0.0
Agricultural sciences	4.0	4.0	0.0
Medical sciences, outside medical schools	30.3	30.3	0.0
Other sciences	22.7	22.7	0.0

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

The comprehensive universities spent another $93.3 million on construction in the physical sciences, while liberal arts colleges spent $3.5 million in construction in the physical sciences.

Expenditures to repair/renovate S&E research space in the nondoctorate-granting institutions were somewhat more evenly distributed across S&E fields than were construction expenditures. However, of the $51.1 million spent by comprehensive institutions to repair/renovate existing S&E research space, two fields absorbed more than $10 million each in repair and renovation. Comprehensive universities spent $14.8 million to repair/renovate S&E research space in engineering and $11.8 million to repair/renovate S&E research space in the social sciences. Another $9.5 million was spent on physical science research space, and $8.2 million was spent on the biological sciences (Table 8-6).

Table 8-6. Expenditures to repair/renovate science and engineering (S&E) research space in nondoctorate-granting institutions by field: 1994-1995 (dollars in millions)

Field	Nondoctorate-granting	Comprehensive	Liberal Arts
Total	$76.8	$51.1	$25.7
Biological sciences	16.4	8.2	8.2
Physical sciences	19.0	9.5	9.5
Psychology	3.4	0.0	3.4
Social sciences	14.2	11.8	2.4
Mathematics	0.7	0.0	0.7
Computer sciences	1.8	0.6	1.2
Earth, atmospheric, and ocean sciences	4.7	4.7	0.0
Engineering	15.1	14.8	0.3
Agricultural sciences	1.0	1.0	0.0
Medical sciences, outside medical schools	0.0	0.0	0.0
Other sciences	0.4	0.4	0.0

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

The liberal arts colleges spent the most to repair/renovate S&E research space in the physical sciences ($9.5 million). The biological sciences accounted for another $8.2 million of the repair/renovation expenditures of liberal arts colleges in fiscal years 1994-1995.

How Did Nondoctorate-Granting Institutions Fund Construction and Repair/Renovation Projects?

The bulk of funding for construction at nondoctorate-granting institutions came from state and local governments (88 percent). Smaller proportions came from private donations (5 percent) and institutional funds (4 percent); and a small amount (2 percent) of total construction funding for S&E research space in the nondoctorate-granting institutions came from the Federal government.

Comprehensive universities funded construction quite differently than did liberal arts colleges. Almost all (99 percent) of the construction funding for comprehensive universities was provided by state and local governments in fiscal years 1994-1995. The majority of construction funding in the liberal arts colleges came from two sources, private donations (44 percent) and tax-exempt bonds (40 percent).

Table 8-7: Sources of funding to construct science and engineering (S&E) research space at nondoctorate-granting institutions: 1994-1995

Source of Funding	*Nondoctorate-granting*	*Comprehensive*	*Liberal Arts*
Dollar contribution (in millions)[1]			
All sources	$330.6	$294.5	$36.1
Federal government	5.2	3.2	2.0
State/local government	290.5	290.5	0.0
Private donations	16.0	0.0	16.0
Institutional funds	4.4	0.8	3.6
Tax-exempt bonds	14.5	0.0	14.5
Other debt	0.0	0.0	0.0
Other sources	0.0	0.0	0.0
Relative contribution			
Federal government	2%	1%	6%
State/local government	88	99	0
Private donations	5	0	44
Institutional funds	1	0	10
Tax-exempt bonds	4	0	40
Other debt	0	0	0
Other sources	0	0	0

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

State and local governments also provided the largest share of repair/renovation funding at nondoctorate-granting institutions (44 percent), although other sources provided substantial amounts. Private donations (22 percent), institutional funds (12 percent), and Federal government funds (11 percent) accounted for 45 percent of repair/renovation funds.

As with construction, comprehensive universities and liberal arts colleges used different sources to fund the repair/renovation of S&E research space. Comprehensive institutions relied heavily on state and local governments (64 percent), as well as the Federal government (17 percent). All of these funds accounted for little of the liberal arts colleges' repair/renovation funding (less than 1 percent altogether). Sixty-three percent of all repair/renovation funding for S&E research space in liberal arts colleges came from private donations (Table 8-8).

Table 8-8: Sources of funding to repair/renovate science and engineering (S&E) research space at nondoctorate-granting institutions: 1994-1995

Source of Funding	*Nondoctorate-granting*	*Comprehensive*	*Liberal Arts*
Dollar contribution (in millions)[1]			
All sources	$76.8	$51.1	$25.7
Federal government	8.8	8.7	0.0
State/local government	32.6	32.6	0.0
Private donations	17.0	0.9	16.1
Institutional funds	9.5	6.6	2.9
Tax-exempt bonds	6.6	0.0	6.6
Other debt	2.3	2.3	0.0
Other sources	0.0	0.0	0.0
Relative contribution			
Federal government	11%	17%	0%
State/local government	42	64	0
Private donations	22	2	63
Institutional funds	12	13	11
Tax-exempt bonds	9	0	26
Other debt	3	4	0
Other sources	0	0	0

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

What Were the S&E Facilities Needs of Nondoctorate-Granting Institutions?

Nondoctorate-granting institutions reported $772 million in capital projects that were needed but had to be deferred because sufficient funding was not available. Forty-seven percent of these costs were for construction projects, while the balance (53 percent) was for repair/renovation projects. Overall, 80 percent of these deferred costs were identified in institutional plans; 88 percent of deferred construction needs and 72 percent of repair/renovation projects had been included in institutional plans (Table 8-9).

Table 8-9. Expenditures for deferred capital projects to construct or repair/renovate science and engineering (S&E) research facilities at nondoctorate-granting institutions by institution type, type of project, and whether project was included in institutional plans (dollars in millions)

Institution type	*Included in Institutional Plans*		*Not Included in Institutional Plans*		*Total*
	To construct new S&E research facilities	*To repair/renovate existing S&E research facilities*	*To construct new S&E research facilities*	*To repair/renovate existing S&E research facilities*	
Total	$322	$295	$42	$113	$772
Comprehensive	249	195	39	93	576
Liberal Arts	73	100	3	20	196

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Comprehensive institutions accounted for three-quarters of all deferred capital project costs ($576 million divided by $772 million). Comprehensive institutions accounted for a larger proportion of construction costs (79 percent) than repair/renovation costs (71 percent).

Liberal arts colleges had more extensive plans than comprehensive institutions. Overall, 88 percent of liberal arts colleges' deferred needs were identified in institutional plans (96 percent of construction needs and 83 percent of repair/renovation needs). By contrast, comprehensive institutions had identified 77 percent of their deferred needs in institutional plans (87 percent of construction needs and 68 percent of repair/renovation needs).

Chapter 9

Animal Care Facilities

Highlights . . .

- Eighty-eight percent of all research-performing institutions had laboratory animal facilities in 1996.
- Most of the laboratory animal research space--93 percent--was concentrated in the doctorate-granting institutions.
- Institutions with animal research space reported that 82 percent of this space fully met government regulations.
- Six percent of the institutions with animal research facilities were scheduled to construct animal facilities in fiscal year 1996 or 1997, with a total estimated cost of $164.1 million.

Background

Scientists in the fields of biology, agriculture, psychology, and medicine often use animals in conducting their research. Concern about the safekeeping and proper use of such animals prompted Congress to pass several different laws that regulate animal facilities used for research and housing--laws that provide guidelines for the humane care of animals used in research, teaching, and testing. Issues related to the housing of animals and the laboratories in which research is conducted are examined in this chapter.

The Survey Questions

Institutions estimated the amount of both animal housing space and animal laboratory space to arrive at a total amount of animal research space. In addition, institutions provided estimates of the amount of space that met government regulations, needed some repair or renovation to meet those regulations, or needed major repairs or replacement in order to meet regulations. Repair/renovation costs and space as well as construction costs and NASF scheduled for fiscal year 1996 or 1997, also were provided. (See Item 8 of the survey, in Appendix C.)

Data Considerations

Institutions were asked to include as laboratory animal facilities both departmental and central facilities that are subject to government and state policies and regulations concerning the humane care and use of laboratory animals. Not included were agricultural buildings that did not directly support research or that were not subject to government regulations; nor were areas for the veterinary treatment of animals.

Findings

How Much Space Was Devoted to Animal Research?

In 1996, 490 of the 560 research-performing institutions (88 percent) had laboratory animal facilities. The doctorate-granting institutions were more likely than the nondoctorate-granting institutions to have such facilities (93 percent and 79 percent respectively) (Table 9-1).

Institutions reported a total of 12.2 million NASF of animal research space. Most of that space (11.4 million NASF) was contained in the doctorate-granting institutions. Within the doctorate-granting institutions, 8.4 million NASF of the animal research space were in the top 100 universities and 3.0 million NASF were in the other doctorate-granting institutions. The nondoctorate-granting institutions reported .8 million NASF of animal research space.

In general, the distribution of animal research space approximated the distribution of S&E research space. The top 100 institutions accounted for 72 percent of all S&E research space and 69 percent of animal research space. The other doctorate-granting institutions had 23 percent of the S&E research space and 26 percent of the animal research space; and the nondoctorate-granting institutions accounted for 4 percent of the overall S&E research space and 7 percent of the animal research space (Table 9-1).

Table 9-1. Amount and distribution of laboratory animal facilities by institution type: 1996

	Institutions with Laboratory Animal Facilities		***Total Animal Research Space***	
Institution type	***Number***	***Percentage of Institutions***	***NASF in Millions***	***Percentage of Total Animal Research NASF***
Total	490	88%	12.2	100%
Doctorate-granting	297	93	11.4	93
Top 100 in research expenditures	97	97	8.4	69
Other	200	92	3.0	24
Nondoctorate-granting	192	79	0.8	7

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Overall, approximately two-thirds of the total animal research space (8.0 million NASF) was used to house laboratory animals, and one-third (4.2 million NASF) was considered animal laboratory space. The relatively small amount of animal research space in nondoctorate-granting institutions was evenly divided between animal housing space (.4 million NASF) and animal laboratory space (.4 million NASF) (Table 9-2).

Table 9-2. Amount and distribution of laboratory animal space by use and institution type: 1996

	Animal Housing Space		***Animal Laboratory Space***	
Institution type	*NASF in Millions*	*Percentage of Total Animal Research NASF*	*NASF in Millions*	*Percentage of Total Animal Research NASF*
Total	8.0	67%	4.2	33%
Doctorate-granting	7.7	68	3.7	32
Top 100 in research expenditures	5.8	69	2.6	31
Other	1.9	63	1.1	37
Nondoctorate-granting	0.4	50	0.4	50

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

How Much Animal Research Space Met Government Regulations?

Institutions with animal research space reported that about 10 million NASF of that space (82 percent) met government regulations in 1996. Another 1.2 million NASF of the animal research space (10 percent) needed limited repair/renovation to meet the regulations, and 1.1 million NASF (9 percent) needed major repair/renovation (Table 9-3).

Table 9-3. Percentage of animal care research space meeting government regulations by institutional type: 1996[1]

Institution type	*Fully meets government regulations*	*Needs limited repair/renovation to meet government regulations*	*Needs major repair/renovation to meet government regulations*
Total	82%	10%	9%
Doctorate-granting	81	10	9
Top 100 in research expenditures	80	12	8
Other	84	4	12
Nondoctorate-granting	92	6	2

[1] Percentages may not total to 100 due to rounding.

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Nondoctorate-granting institutions were most likely to report their animal research space met government regulations, with 92 percent (.74 million NASF) in full compliance. Similarly, only 2 percent of the animal research space at the nondoctorate-granting institutions was reported to need major repair/renovation to meet government regulations.

How Much Construction and Repair/Renovation Was Scheduled for Animal Research Space?

Overall, 30 of the research-performing institutions (6 percent of those with animal research facilities) were scheduled to construct animal facilities in fiscal year 1996 or 1997. Twenty-six doctorate-granting universities were scheduled to construct facilities, and four of the nondoctorate-granting institutions had such construction scheduled (Table 9-4).

Table 9-4. Scheduled construction and repair/renovation for laboratory animal facility improvement: 1996-1997

Institution Type	***Scheduled Construction***			***Scheduled Repair/Renovation***		
	Number of Institutions	*Percent of Institutions*	*Cost (in Millions)*	*Number of Institutions*	*Percent of Institutions*	*Cost (in Millions)*
Total	30	6%	$164.1	72	13%	$83.3
Doctorate-granting	26	8	162.1	64	20	78.9
Top 100 in research expenditures	20	20	112.8	36	36	48.1
Other	6	3	49.3	28	13	30.8
Nondoctorate-granting	4	2	2.0	8	3	4.4

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

The total estimated cost of animal facility construction was $164.1 million, with 99 percent of the construction dollars ($162.1 million) in the doctorate-granting institutions.

Research-performing institutions with animal research facilities were more likely to have scheduled repair/renovation to improve their animal facilities than to have scheduled construction for fiscal year 1996 or 1997. In all, 72 institutions (13 percent) had repair/renovation scheduled. However, the total scheduled repair/renovation costs ($83.3 million) were almost half the total scheduled construction costs of $164.1 million. The doctorate-granting institutions accounted for 95 percent of the scheduled repair/renovation costs ($78.9 million).

Scheduled construction of animal research space totaled 644,774 NASF (Table 9-5). The amount reported to need major repair/renovation to meet government regulations was 1.1 million NASF. The total amount of space scheduled for repair/renovation in fiscal year 1996 or 1997 was 531,821 NASF. Institutions reported that about 1.2 million NASF of animal research space needed limited repair/renovation to meet government regulations.

Table 9-5. NASF scheduled for construction and repair/renovation of laboratory animal facilities: 1996-1997

Institution type	*Construction*	*Repair/Renovation*
Total	644,774	531,821
Doctorate-granting	637,775	518,655
Top 100 in research expenditures	384,711	313,041
Other	253,064	205,614
Nondoctorate-granting	7,000	13,165

Components may not add to total due to rounding.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Appendix A

Technical Notes

Technical Notes

This appendix discusses the study methodology as well as various other technical aspects that the reader should consider when interpreting the data presented in this report. In addition to the current 1996 survey, the discussion includes the original 1988 survey, and the 1990, 1992 and 1994 surveys. The following topics are covered:

- Universe and sample
- The surveys
- Data collection and response rates
- Item nonresponse
- Weighting
- Reliability of survey estimates
- Data considerations, definitions, and limitations

Universe and Sample

1988 Survey

The 1988 survey was designed to provide estimates for all research-performing academic institutions, as defined in the National Science Foundation's (NSF) Fiscal Year (FY) *1983 Survey of Scientific and Engineering Expenditures at Universities and Colleges*. The universe datafile for the 1983 expenditures survey included *all* universities and colleges that offered a master's or doctorate degree in science and engineering (S&E), all others that reported separately budgeted S&E research and development (R&D) expenditures of $50,000 or more, and all Historically Black Colleges and Universities (HBCUs) that reported any R&D expenditures. This datafile represented the most recent available universe survey of R&D expenditures at academic institutions. The datafile contained a total of 566 institutions.

All HBCUs in the frame were included in the sample with certainty (N=30), and a stratified probability sample of 223 institutions was selected from among the remaining institutions in the frame. These institutions were first stratified by control (public versus private) and highest degree awarded in S&E (doctorate-granting versus nondoctorate-granting). A minimum sample size of 25 was set for each of the four resulting strata, and the remaining sample was allocated to strata in proportion to the "size" of each stratum. Stratum size was defined as the square root of the aggregate R&D expenditures in S&E of the institutions in the stratum. Academically administered Federally Funded Research and Development Centers were excluded from this survey. Within strata, institutions were sampled with probability proportionate to size. Again, size was defined as the square root of the institution's fiscal year 1983 R&D expenditures.

Following the selection of an initial sample of 253 institutions, NSF determined that several of the sampled institutions were out of scope of the survey. Out of scope institutions included those in outlying territories, military academies, and three highly specialized institutions considered inappropriate, given the nature of their programs. Elimination of these out of scope cases reduced the final sample to 247 institutions, of which 29 were HBCUs and 99 had (or were) medical schools.

Institutions in the sample accounted for more than 75 percent of all academic R&D expenditures in fiscal year 1983 and encompassed at least 70 percent of the spending in each major S&E discipline. The sample represented a weighted national total of 525 institutions. The composition of this survey universe, by type of institution, is shown in Table A-1.

Table A-1. Number of institutions in the survey universe of research-performing colleges and universities: weighted estimates, 1988

Institution type	*Total*	*Non-HBCUs* [1]		*HBCUs* [1]
		Public	*Private*	
Total	525	296	200	29
Doctorate-granting:	293	190	100	3
Top 100 in research expenditures	100	69	31	0
Other	193	121	69	3
Nondoctorate-granting	232	106	100	26

[1] HBCU refers to Historically Black Colleges and Universities.

SOURCE: National Science Foundation/SRS, 1988 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

1990 Survey

The institution sample for the 1990 survey was the same as for the 1988 survey, except for these two changes:

- The sample was updated to reflect recent R&D patterns as shown in NSF's fiscal year 1988 R&D expenditures survey, which collected expenditures data for all institutions in the survey frame for the first time since 1983. School-by-school comparisons of these two databases resulted in the identification of 12 institutions whose 1988 R&D expenditures would have given them substantially higher probabilities of selection than they had using 1983 expenditures. These 12 institutions were made certainty selections for the 1990 survey. Five were already in the sample, having been noncertainty selections in the 1988 study; the other seven were added to the sample for the 1990 survey.

- One institution from the 1988 sample became out of scope when it distributed its assets among other institutions in the same state system. Therefore, this institution was eliminated from the sample.

The same changes noted above produced a net increase of six institutions, increasing the sample size to 253 in 1990. The universe represented by the sample, however, did not change. The sample design for the 1990 survey is summarized in Table A-2.

1992 Survey

The institution universe and sample for the 1992 survey were the same as for the 1990 survey, except for three changes:

- Shortly after the sample for the 1990 facilities survey was selected, NSF conducted a universe survey of all HBCUs and identified an expanded group of 70 that reported separately budgeted R&D expenditures in S&E disciplines. A sample of 46 of these 70 institutions was selected for the 1992 facilities survey, with probability proportionate to size. Size was measured as the square root of the institution's reported 1989 R&D expenditures (a minimum size measure of $10,000 was used to afford the smallest institutions some possibility of selection).
- The sample was expanded to include all institutions in the top 100 in 1988 R&D expenditures. Only two institutions from this analytically important category were not already in the sample, and they were made certainty selections in 1992.
- To improve the precision of estimates for nondoctorate-granting institutions, an expanded sample of 91 institutions in this category was selected (excluding HBCUs, which were sampled separately). The sample included all (10) public institutions with 1988 R&D expenditures of $2 million or more, and all (11) private institutions with 1988 expenditures of $1 million or more. Institutions with R&D expenditures below these cutoffs were sampled with equal selection probabilities.

Of the 91 sampled nondoctorate-granting institutions, nine were later determined to be out of scope, since they reported in the 1992 facilities survey that they had no

S&E research space and also reported in the 1988 R&D expenditures survey (which provided the basis for the sampling frame) that they had less than $50,000 in separately budgeted R&D expenditures. The exclusion of these out of scope institutions reduced the sample of nondoctorate-granting institutions to 82. The sample design for the 1992 survey is summarized in Table A-2.

1994 Survey

The institution universe and sample for the 1994 survey closely matched the 1992 survey, with the following exceptions:

- The 1991 R&D expenditures survey information was used to generate the top 100 stratum. Three institutions were added to the top 100 list, and three institutions were moved out. The expenditures data also were used to calculate the measure of size for the doctorate-granting institutions. The 1988 expenditures survey data were used to calculate size measures for the nondoctorate-granting institutions, since subsequent surveys did not yield complete information for the nondoctorate-granting institutions.
- Institutions expending less than $50,000 in R&D in S&E fields were removed from the frame prior to sampling. In 1992, they were selected with probability proportionate to size and then excluded after contact.
- FICE codes were updated for 50 institutions.[1]
- Six institutions were misclassified with the 1992 sampling list as nondoctorate-granting, when in fact they did award S&E doctorates. These misclassifications were corrected.
- Random (rather than systematic) draws from the strata were employed.
- The HBCUs selected with certainty were redefined to include 28 from the 1990 list,[2] plus all of the new institutions selected with certainty in 1992. This meant that a total of 33 HBCUs was selected with certainty and 12 others were selected with probability proportionate to size.

Of the 314 sampled institutions, five nondoctorate-granting institutions were later determined to be out of scope, since they reported no S&E research space. The exclusion of these out of scope institutions reduced the sample to 309.

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[1] This is the Federal Interagency Commission on Education number assigned by the Department of Education. Numbers beginning with 66 are for accredited institutions which have not yet received a FICE number. These are identification numbers for the record file only.

[2] One of the 29 HBCUs selected with certainty in 1990 was excluded because it had no current funded R&D at the time the sample was taken.

1996 Survey

The institution universe and sample for the 1996 survey were the same as the universe and sample from the 1994 survey. No institutions were added, and none was deleted.

Seven of the nondoctorate-granting institutions in the sample reported no S&E research space in their survey response and were determined to be out of scope. The exclusion of these seven institutions reduced the sample to 307.

The sample design for the 1990, 1992, 1994, and 1996 surveys is summarized in Table A-2. (See Appendix B for a list of 1996 sampled institutions.)

Table A-2. Number of institutions in the 1990, 1992, 1994 and 1996 samples of research performing colleges and universities

Institution type	***Non-HBCUs***												***HBCUs***[1]			
	Total				*Public*				*Private*							
	1990	**1992**	**1994**	**1996**	**1990**	**1992**	**1994**	**1996**	**1990**	**1992**	**1994**	**1996**	**1990**	**1992**	**1994**	**1996**
Total	224	257	265	254	138	157	161	156	86	100	104	98	29	46	44	44
Doctorate-granting:	173	175	177	173	115	117	117	116	58	58	60	57	3	5	8	10
Top 100 in research expenditures	98	100	100	100	67	69	70	70	31	31	30	30	0	0	0	0
Other	75	75	77	73	48	48	47	46	27	27	30	27	3	5	8	10
Nondoctorate-granting	51	82[2]	88	81	23	40	44	40	28	42	44	41	26	41	36	34

[1] HBCU refers to Historically Black Colleges and Universities.

[2] Sample initially included nine other institutions that were later classified as out of scope of the study.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

The Survey Questionnaire

The 1996 survey questionnaire, reproduced in Appendix C, updated information collected during earlier (1988, 1990, 1992 and 1994) surveys regarding several topics:

- The total net assignable square feet (NASF) of space in science and engineering disciplines, and the NASF used for organized research;
- The total amount of space in all non-science disciplines, and an overall space total across all academic disciplines;
- The amount of research space that is leased by the institution;
- The condition of research facilities in each S&E discipline;
- The adequacy of the current amount of research space, by S&E discipline;

- The project costs, NASF, and sources of funds for major repair/renovation ($100,000 or more) and construction activities initiated in fiscal years 1994 and 1995 and scheduled for fiscal year 1996 or 1997;
- Expenditures for research facility repair/renovation projects in the $5,000 to $100,000 range;
- The existence of an approved institutional plan that included deferred space requiring repair/renovation or new construction;
- The number of years included in the plan;
- The estimated costs for needed repair/renovations and new construction, by S&E discipline, that the institution was not scheduled to begin during fiscal year 1996 or 1997;
- Scheduled expenditures in fiscal year 1996 or 1997 for construction and repair/renovation of research laboratory animal facilities; and
- The status of the institutions relative to the cap of tax-exempt bonds (applicable only to private universities and colleges).

In addition to collecting updated information on the above topics, the 1996 questionnaire expanded five questions to collect additional information that had not been addressed previously. The additional information included:

- the additional amount of space needed in a discipline if the current amount was reported to be inadequate;
- the amount of space in a discipline that was scheduled to undergo major renovation or replacement if any space in that discipline was reported to require major renovation or replacement;
- the central campus infrastructure costs ($100,000 or more) scheduled for repair/renovation or new construction in fiscal year 1996 or 1997;
- the central campus infrastructure costs for repair/renovation or new construction that were needed but not funded; and
- the estimated costs not in an institutional plan for needed repair/renovations and new construction, by S&E discipline, that the institution was not scheduled to begin during fiscal year 1996 or 1997.

One new question was added to the 1996 survey that asked for additional comments from the institutions. The optional, open-ended question was designed with two purposes in mind. It allowed the institutions to:

- provide information that numerical data could not capture; and

- help identify new areas of concern relating to S&E research facilities which, in the future, would assist in the development of new survey questions.

Finally, the response categories for two questions were modified slightly in 1996 from previous years' surveys. The questions are about the adequacy of the amount and the condition of S&E research space (see "Data Considerations" later in this appendix for details).

Disk-Based Survey

For the first time since the Facilities Survey began in 1988, institutions had the option in 1996 of responding to the survey either on the printed questionnaire or through a disk-based version of the survey. Institutions were encouraged to utilize the disk version, which contained their 1994 responses. The disk version was programmed to detect logic errors across the 1996 survey items, as well as inconsistencies from the institution's 1994 responses.

Data Collection and Response Rates

In August 1995 a letter from Neal Lane, Director of the National Science Foundation, was sent to the president or chancellor of each sampled institution, asking that the institution participate in the study and that a coordinator be named for the survey. A letter of endorsement of the project signed by the heads of eight higher education associations also was enclosed. A few days following the two-week deadline for returning the coordinator identification card, telephone follow-up was conducted with all sampled institutions that had not yet identified a survey coordinator. Survey materials, including both a printed survey and DOS-based disk survey, were mailed to the coordinator in mid-October by Federal Express. The questionnaire and cover letter requested return of the completed survey by December 1, 1995. Nonresponse follow-up began in mid-December and continued through March 1996.

As printed versions of the survey were returned, responses were entered on the disk version to run the series of logic and arithmetic checks. Responses returned on the disk version were available immediately for analysis. Telephone follow-up was conducted with the institutions to resolve data inconsistencies discovered during analysis.

The overall response rate for the 1996 survey was 97 percent, the highest response rate ever in the survey's history. Response rates for the top 100 institutions and the HBCUs were 100 percent, as Table A-3 indicates.

Table A-3. Academic institution response rates, by category of institution: 1996

Institution type and control	*Number of institutions*		*Response rate*
	Sample	*Respondents*	
Total	307	298	97%
Doctorate-granting:	178	173	97
Top 100 in research expenditures	100	100	100
Other	78	73	94
Nondoctorate-granting	85	81	95
Public	161	156	97
Private	102	98	96
HBCUs [1]	44	44	100

[1] HBCU refers to Historically Black Colleges and Universities.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Item Nonresponse

After machine editing of questionnaire responses for completeness, internal consistency, and consistency with data from previous questionnaires, extensive telephone data retrieval was conducted to minimize the amount of missing or otherwise problematic responses to individual questionnaire items. As a result of these persistent follow-up activities, most of the individual items had very low item nonresponse rates.

One exception was the item (1a) on total academic space in all disciplines outside S&E fields. As in previous surveys, this item was difficult for some institutions to answer and, though data retrieval was attempted, it had an unusually high nonresponse rate (37 missing or 12 percent). Items on the amount (Item 1), adequacy or inadequacy assessment (Item 2), current condition (Item 3), completed construction and repair/renovation (Item 4), planned construction and repair/renovation (Item 6), and additional need (Item 7) of research space had fewer than 2 percent missing values in each field.

Missing values were imputed for questionnaire items that were involved in the data analysis. Missing data on total academic space outside S&E fields were imputed based on the ratio of total academic space to total space in S&E fields. In Items 2 and 3, reported percentages were converted to NASF based on the amount of research space in Item 1. In Items 4, 6 and 8 (on completed capital projects, planned capital projects, and scheduled animal facility improvement), most missing values involved either missing costs or missing NASF, but not both. In these cases, the missing data element was imputed from the reported element, using 1994 data on average cost per NASF to estimate the one from the other.

Missing values that could not be imputed using the above methods were imputed using a "hot deck" approach. This involved imputing the missing value from a "donor" institution that did provide the needed information and that was as closely matched as possible to the institution with the missing information in terms of control, type (doctorate-granting or nondoctorate-granting) and FY 1994 research expenditures.

Weighting

After data collection, sampling weights were created for use in preparing national estimates from the data. First, within each weight class, a base weight was created for each institution in the sample. The base weight is the inverse of the probability of selecting the institution for the sample. Second, because some institutions in the sample did not respond to the survey, the base weights were adjusted in each weight class to account for this unit nonresponse. Finally, the weights were adjusted again to bring the number of estimated institutions in accordance with the known number of institutions in various categories. For this final "poststratification" adjustment, the institutions were classified by type (top 100 in research expenditures, other doctorate-granting, nondoctorate-granting), control, and HBCU status. The poststratified weights were used to produce the estimates shown in this report. The weighting procedures were essentially the same as those employed in the 1988, 1990, 1992 and 1994 studies.

Reliability of Survey Estimates

The findings presented in this report are based on a sample and are therefore subject to sampling variability. Sampling variability arises because not all institutions are included in the study. If a different sample of institutions had been selected, then the results might have been somewhat different. The standard error of an estimate can be used to measure the extent of sampling variability for that particular estimate.

One of the ways that the standard error can be used is in the construction of confidence intervals. If all possible samples were selected and surveyed under similar conditions, then the intervals of 2 standard errors below the estimates to 2 standard errors above the estimates would include the average result of these samples in about 95 percent of the cases. Since only one sample is actually selected and surveyed, the standard error must be estimated from the sample itself. The interval constructed using the estimated standard error from the sample is called a 95 percent confidence interval. Estimated standard errors for selected statistics are shown in Table A-4.

Table A-4. Standard errors (S.E.) for selected estimates

	Total		*Doctorate-granting*						*Nondoctorate granting*		*Public*		*Private*	
			Total		Top 100 research		Other							
Statistic	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**
Total research NASF (in thousands):														
1988	112,062	1,864	107,443	2,004	80,627	1,419	26,815	2,109	4,619	437	82,384	1,627	29,678	868
1990	116,327	4,054	111,166	4,062	81,659	1,327	29,508	3,574	5,161	485	86,880	3,538	29,447	1,591
1992	122,015	4,079	117,373	4,185	87,508	0	29,865	4,185	4,642	316	90,815	3,612	31,200	969
1994	127,369	2,885	121,930	2,766	90,974	0	30,865	2,766	5,439	372	91,723	2,163	35,645	1,569
1996	136,480	1,467	130,684	1,384	98,273	0	32,411	1,384	5,797	381	98,958	1,665	37,522	1,493
Difference:														
1990 & 1988	4,265	3,586	3,723	3,659	1,032	3	2,693	3,659	542	205	4,496	3,026	231	1,385
1992 & 1990	5,687	6,239	6,207	6,404	5,849	1,327	358	6,412	519	481	3,934	6,246	1,753	1,200
1994 & 1992	5,354	4,996	4,557	5,016	3,466	0	1,091	5,016	797	488	908	4,210	4,445	1,844
1996 & 1994	9,111	3,237	8,754	3,093	7,299	0	1,455	3,093	358	532	7,235	2,730	1,877	2,166
Repair/ renovation Cost (dollars in millions):														
1988	838	60	793	58	596	10	197	59	45	8	436	38	402	27
1990	1,010	265	979	264	483	12	496	259	30	15	699	266	311	18
1992	825	40	794	38	632	0	161	38	32	9	449	41	376	15
1994	837	45	803	44	623	0	180	44	34	5	522	41	315	21
1996	1,058	48	981	47	755	0	226	47	77	21	496	35	562	40
Difference:														
1990 & 1988	172	269	186	267	113	18	299	261	15	22	263	265	91	35
1992 & 1990	185	269	185	267	150	12	355	262	2	39	250	270	65	38
1994 & 1992	12	60	9	58	9	0	19	58	2	10	73	58	61	26
1996 & 1994	221	66	178	64	132	0	46	64	43	22	26	54	247	45
Repair/ renovation NASF (in thousands):														
1988	13,431	1,305	12,841	1,345	9,124	304	3,717	1,299	590	90	8,745	1,196	4,685	528
1990	11,449	576	10,993	488	7,781	179	3,212	464	456	229	8,223	473	3,226	237
1992	8,606	657	8,344	624	5,622	0	2,722	624	262	81	5,420	613	3,187	180
1994	9,134	632	8,811	611	6,028	0	2,783	611	323	79	6,011	496	3,123	320
1996	13,122	758	12,364	746	8,758	0	3,606	746	758	113	6,839	498	6,282	681
Difference:														
1990 & 1988	-1,982	1,343	1,848	1,252	1,343	351	505	1,276	134	251	522	1,233	1,459	384
1992 & 1990	-2,841	928	2,649	914	2,159	179	490	841	194	228	2,804	788	38	328
1994 & 1992	528	912	467	873	406	0	61	873	61	113	591	789	64	367
1996 & 1994	3,988	987	3,553	964	2,730	0	823	964	435	138	828	703	3,159	752

KEY: "NASF" = net assignable square feet

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities*

Table A-4. Standard errors (S.E.) for selected estimates (continued)

	Total		*Doctorate-granting*						*Nondoctorate-granting*		*Public*		*Private*	
			Total		**Top 100 research**		**Other**							
Statistic	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**
New construction cost (dollars in millions):														
1988	2,051	73	1,888	72	1,599	64	288	53	163	19	1,355	36	696	75
1990	2,464	128	2,315	131	1,558	34	757	114	150	56	1,727	108	738	62
1992	2,975	150	2,847	164	2,022	0	826	164	128	99	2,020	110	956	87
1994	2,859	195	2,766	190	2,076	0	690	190	92	42	2,063	157	7,996	110
1996	2,767	240	2,437	99	2,007	0	430	99	330	189	1,872	251	895	58
Difference														
1990 & 1988	4,114	140	427	128	-41	83	469	127	-13	60	372	102	42	84
1992 & 1990	511	231	532	249	464	34	69	233	-22	116	293	165	218	115
1994 & 1992	-116	246	-81	251	54	0	-136	251	-36	107	43	192	-160	140
1996 & 1994	-92	309	-329	214	-69	0	-260	214	238	194	-191	296	99	124
New construction NASF (in thousands)														
1988	9,922	387	8,908	401	7,261	215	1,647	407	1,014	117	7,344	223	2,578	271
1990	10,647	851	9,840	776	6,073	86	3,747	747	807	337	8,115	805	2,532	153
1992	11,817	816	11,022	1,000	6,972	0	4,050	1,000	795	225	8,268	7,857	3,549	230
1994	11,056	974	10,538	902	6,851	0	3,687	902	518	265	8,253	892	2,803	342
1996	9,521	762	8,818	679	6,427	0	2,391	679	703	278	6,838	788	2,683	143
Difference														
1990 & 1988	726	903	932	765	-1,188	242	2,120	881	-207	366	771	772	-46	244
1992 & 1990	1,170	1,508	1,181	1,659	899	86	283	1,633	-12	419	152	1,415	1,017	282
1994 & 1992	-761	1,271	-484	1,347	-121	0	-363	1,347	-277	348	-15	1,170	-746	412
1996 & 1994	-1,535	1,237	-1,720	1,129	-424	0	-1,296	1,129	185	384	-1,415	1,190	-120	371

KEY "NASF" = net assignable square feet

SOURCE National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities

Table A-4. Standard errors (S.E.) for selected estimates (continued)

	Suitable for sophisticated research		***Effective for most purposes***		***Needs limited repair/renovation***		***Needs major repair/renovation***	
Statistic	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**	**Estimate**	**S.E.**
Amount of research space (NASF in thousands):								
1988	26,793	836	41,114	1,175	26,264	646	17,702	397
1990	30,135	1,239	41,072	1,794	27,047	914	18,073	983
1992	32,723	1,356	42,306	1,846	27,620	1,106	19,370	607
1994	33,743	1,078	41,904	1,017	29,700	1,004	22,021	770
1996	50,816	1,181	59,970	1,311			25,195	456

KEY "NASF" = net assignable square feet

SOURCE National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities

The standard errors for this study were estimated using a replication method called the jackknife repeated replication method. Using this method, the full sample is divided into 13 replicates, and estimates are produced for each replicate. The variability among these replicate estimates is then used to estimate the standard error.

Data Considerations, Definitions, and Limitations

In addition to sampling errors, survey estimates can be adversely affected by nonsampling errors. Errors of this type include those resulting from reporting and processing of data. In this survey, extensive follow-up with respondents was used to ensure that the data were as accurate as possible. This follow-up included cross-year review that verified inconsistencies between the current and previous questionnaires.

Research Square Footage

In the 1994 survey, research was defined more broadly than in previous years, and this definition was continued in 1996. However, this change in definition has had little effect on how institutions actually reported S&E research space. Like the definition used in previous years, the 1994 definition included all R&D activities that are separately budgeted and accounted for. Unlike the previous definition, the 1994 definition also included departmental research that was not separately budgeted. Conversations with respondents from earlier surveys revealed that some departmental research had been included; thus, the current definition of research reflects what many institutions had been reporting all along.

In 1996, for the first time the survey included a definition of "net assignable square feet" (NASF). NASF was defined as the sum of all areas (in square feet) on all floors assignable to, or available to be assigned to, an occupant for specific use, such as instruction or research. It is unlikely that this inclusion had any effect on trends in this item.

Institutions' facility recordkeeping systems vary considerably. In general, most of the larger institutions have central computerized facility inventory systems, often based on space surveys conducted specifically for OMB Circular A-21. Many institutions with smaller research programs are not required to calculate square footage for OMB Circular A-21, and do not maintain databases that can provide such information. These institutions had to calculate or estimate square footage information specifically for this study.

Condition and Adequacy of Research Facilities

Questions eliciting assessments of the condition of S&E research space or its adequacy are by their very nature subjective. Two persons may make different assessments of the same facility or have different opinions of what is required in order for a facility to be suitable for a particular type of research. Despite the subjectivity involved, these items do capture an overall picture of the current status of facilities.

In 1996, the wording and response choices of the questions assessing both the condition of the institution's S&E research space and its adequacy were altered slightly from that used in previous years. Respondents were given only three possible choices for evaluating the adequacy of the amount of S&E research space: adequate, inadequate, or not applicable. Five choices had been provided in 1994. Response possibilities for assessing the current condition of S&E research space were reduced from six choices in 1994 to four in 1996. Thus, percentage changes on these two items must be interpreted with some caution.

Capital Projects Involving Research Facilities

Few institutions maintain information on construction and repair/renovation projects specific to research facilities. Many capital projects involve both research and nonresearch space. When a project was not exclusively for research, institutions had to estimate the proportion of the project that was related to research.

For projects taking more than one year to complete, institutions were asked to allocate the project to the fiscal year in which actual construction activity began or was scheduled to begin.

Because institutions use different dollar values to identify "major projects," this survey established a guideline to ensure consistency of reporting. As in previous cycles of the survey, projects with costs of $100,000 or more associated with research facilities were included. In 1992, 1994 and 1996, the surveys also had a separate question about costs of repair/renovation projects in the $5,000 to $99,999 range.

Dollar Amounts: Current Versus Constant Dollars

In 1994, for the first time, capital project dollar amounts were reported in both constant and current dollars. Both sets of numbers were included in the body of the report but discussion was limited to 1993 constant dollars. The 1996 report also uses both constant and current dollars but the reporting of these two figures differs from the 1994 report. Tables in the body of the report are presented in 1995 constant dollars; tables in Appendix F, "Detailed Statistical Tables," are in current dollars.

As in 1994, dollar amounts in 1996 were adjusted using the Bureau of the Census's Composite Fixed-Weighted Price Index for Construction. Unlike a more general index, this construction index closely tracks inflation within the construction industry. This index reflects only changes in prices and is unaffected by changes in the mix of construction projects during any given year.

Constant dollar tables in the 1996 report cannot be compared to constant dollar tables in the 1994 report.

Specific adjustments used for each of the fiscal years are presented in Table A-5.

Table A-5. Composite Fixed-Weighted Price Index for Construction inflation adjustments

Fiscal year	*Average Composite Fixed-Weighted Price Index for Construction* [1]
1986-1987	1.253
1988-1989	1.166
1990-1991	1.126
1992-1993	1.081
1994-1995	1.000

[1] The index for the second year was used in all calculations that spanned two fiscal years

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Cost per Square Foot Data

The study did not collect unit cost data for individual construction or repair/renovation projects. It collected only the aggregate research-related costs and the aggregate research space involved in all projects begun during specified periods. These aggregates can be combined into indices of average cost per square foot, which are useful in tracking broad cost trends over time. However, they are of little practical value as guidelines for project planning. By all accounts, unit costs for both construction and repair/renovation projects are highly variable, depending on the specific requirements of the particular project and on many other factors as well (e.g., geographic region of the country). Such differences, which are of crucial importance in project planning, are obscured in the kinds of multiproject averages that can be constructed from this study's data.

Deferred Capital Needs

The 1996 survey added several questions in an effort to derive estimates of the S&E research facilities' needs of research-performing institutions. In 1994, institutions were asked to report on deferred construction and repair/renovation projects that were included in an approved institutional plan. In 1996, institutions reported separately the construction and repair/renovation costs for projects included in such plans, as well as for projects not included. In addition, institutions were asked to report their estimated central campus infrastructure needs, separately for construction and repair/renovation, and for both those in plans and those not in plans. This provided a more complete estimate of deferred capital projects.

In addition to this estimate of research facility needs based on institutions' reports of the S&E research construction and repair/renovation projects that had been deferred, the 1996 survey made additional efforts to measure this need. If institutions indicated that they had an inadequate amount of S&E research space in any given field (Item 2), they were asked to indicate the additional space needed. Institutions also were asked to report either the amount or percent of that space that was funded and scheduled to undergo major renovation or replacement (Item 3). It was thus possible to derive estimates of the amount of additional space needed and the amount of repair/renovation needed and not scheduled. Average construction and repair/renovation costs per square foot were used to derive another dollar estimate of research facility needs.

Both of these approaches, based on different assumptions, are believed to provide conservative estimates of the research facility needs of research-performing institutions.

Appendix B

List of Sampled Institutions

List of Sampled Institutions

Public, doctorate-granting institutions

Top 100	*Institution name*	*State*
*	University of Alaska Fairbanks	AK
*	Auburn University	AL
*	University of Alabama at Birmingham	AL
	University of South Alabama	AL
	University of Arkansas	AR
	University of Arkansas for Med Sciences	AR
*	Arizona State University	AZ
*	University of Arizona	AZ
	San Diego State University	CA
*	University of California	CA
*	University of California-Davis	CA
*	University of California-Irvine	CA
*	University of California-Los Angeles	CA
*	University of California-Riverside	CA
*	University of California-San Diego	CA
*	University of California-San Francisco	CA
*	University of California-Santa Barbara	CA
	University of California-Santa Cruz	CA
	Colorado School of Mines	CO
*	Colorado State University	CO

Public, doctorate-granting institutions

Top 100	*Institution name*	*State*
*	University of Colorado-Boulder	CO
	University of Colorado-Colorado Springs	CO
*	University of Colorado Health Sciences Center	CO
*	University of Connecticut	CT
	University of Delaware	DE
	Florida A & M University	FL
	Florida State University	FL
*	University of Florida	FL
*	University of South Florida	FL
*	Georgia Institute of Technology	GA
	Georgia State University	GA
*	University of Georgia	GA
*	University of Hawaii at Manoa	HI
*	Iowa State University	IA
*	University of Iowa	IA
	Idaho State University	ID
	Southern Illinois University at Carbondale	IL
*	University of Illinois at Chicago	IL
*	University of Illinois at Urbana-Champaign	IL
	Ball State University	IN
*	Indiana University	IN
*	Purdue University	IN
	Kansas State University	KS

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Public, doctorate-granting institutions

Top 100	*Institution name*	*State*
*	University of Kansas	KS
	Wichita State University	KS
*	University of Kentucky	KY
	Grambling State University	LA
*	Louisiana State University	LA
	University of Massachusetts at Amherst	MA
*	University of Massachusetts Lowell	MA
	University of Maryland at Baltimore	MD
*	University of Maryland College Park	MD
*	Michigan State University	MI
	Michigan Technological University	MI
*	University of Michigan-Ann Arbor	MI
*	Wayne State University	MI
*	University of Minnesota	MN
*	University of Missouri-Columbia	MO
*	Mississippi State University	MS
	University of Mississippi	MS
	Montana State University	MT
	East Carolina University	NC
*	North Carolina State University	NC
*	University of North Carolina at Chapel Hill	NC
	North Dakota State University	ND
*	University of Nebraska-Lincoln	NE

Public, doctorate-granting institutions

Top 100	*Institution name*	*State*
	University of Nebraska Medical Center	NE
*	Rutgers, The State University of New Jersey	NJ
*	University of Medicine & Dentistry of N J	NJ
	New Mexico Institute of Mining and Technology	NM
*	New Mexico State University	NM
*	University of New Mexico	NM
	University of Nevada-Reno	NV
*	State University of New York at Buffalo	NY
*	State University of New York at Stony Brook	NY
	State University of New York College of Environmental Sciences and Forestry	NY
	State University of New York Health Science Center at Brooklyn	NY
	Bowling Green State University	OH
	Cleveland State University	OH
	Ohio University	OH
*	The Ohio State University	OH
*	University of Cincinnati	OH
*	Oklahoma State University	OK
*	University of Oklahoma	OK
*	Oregon State University	OR
	University of Oregon	OR
*	Pennsylvania State University	PA
	Temple University	PA

Public, doctorate-granting institutions

Top 100	Institution name	State
*	University of Pittsburgh	PA
*	Clemson University	SC
	University of South Carolina	SC
	South Dakota State University	SD
	Memphis State University	TN
	Tennessee State University	TN
*	University of Tennessee, Knoxville	TN
	Lamar University	TX
	Stephen F. Austin State University	TX
*	Texas A & M University	TX
	Texas Tech University	TX
	Texas Woman's University	TX
	University of Houston	TX
	University of North Texas	TX
	University of Texas at Arlington	TX
*	University of Texas at Austin	TX
	University of Texas Health Science Center at Houston	TX
	University of Texas Medical Branch at Galveston	TX
*	University of Texas Southwestern Medical Center at Dallas	TX
*	University of Texas System Cancer Center	TX
*	University of Utah	UT
*	Utah State University	UT

Public, doctorate-granting institutions

Top 100	*Institution name*	*State*
	College of William & Mary	VA
	George Mason University	VA
*	University of Virginia	VA
*	Virginia Commonwealth University	VA
*	Virginia Polytechnic Institute and State University	VA
*	University of Washington	WA
*	Washington State University	WA
*	University of Wisconsin-Madison	WI
	University of Wisconsin-Milwaukee	WI
	West Virginia University	WV

Private, doctorate-granting institutions

Top 100	*Institution name*	*State*
*	California Institute of Technology	CA
*	Stanford University	CA
*	University of Southern California	CA
	University of Denver	CO
	Wesleyan University	CT
*	Yale University	CT
	American University	DC
	George Washington University	DC
*	Georgetown University	DC
	Howard University	DC
*	Florida Institute of Technology	FL
*	University of Miami	FL
	Clark Atlanta University	GA
*	Emory University	GA
	Morehouse School of Medicine	GA
	Loyola University of Chicago	IL
*	Northwestern University	IL
	Rush University	IL
*	University of Chicago	IL
	University of Health Sciences/ The Chicago Medical School	IL
*	Tulane University	LA
	Xavier University of Louisiana	LA

Private, doctorate-granting institutions

Top 100	*Institution name*	*State*
	Boston College	MA
*	Boston University	MA
	Brandeis University	MA
*	Harvard University	MA
*	Massachusetts Institute of Technology	MA
	Smith College	MA
	Tufts University	MA
*	Woods Hole Oceanographic Institute	MA
	Worcester Polytechnic Institute	MA
*	Johns Hopkins University	MD
	Kirksville College of Osteopathic Medicine	MO
	St. Louis University	MO
*	Washington University	MO
*	Duke University	NC
	Wake Forest University	NC
	Dartmouth College	NH
*	Princeton University	NJ
	Seton Hall University	NJ
	Albany Medical College	NY
	Clarkson University	NY
*	Columbia University in the City of New York	NY
*	Cornell University	NY
*	Mount Sinai School of Medicine	NY

Private, doctorate-granting institutions

Top 100	*Institution name*	*State*
*	New York University	NY
	Rensselaer Polytechnic Institute	NY
*	Rockefeller University	NY
*	University of Rochester	NY
*	Yeshiva University	NY
*	Case Western Reserve University	OH
*	Carnegie-Mellon University	PA
	Drexel University	PA
	Lehigh University	PA
	The Medical College of Pennsylvania	PA
	Thomas Jefferson University	PA
*	University of Pennsylvania	PA
	Brown University	RI
	Providence College	RI
	Meharry Medical College	TN
*	Vanderbilt University	TN
*	Baylor College of Medicine	TX
	Rice University	TX
	Marquette University	WI
	Medical College of Wisconsin	WI

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Public, nondoctorate-granting institutions

Institution name	*State*
Alabama Agricultural and Mechanical University	AL
Alabama State University	AL
Trenholm State Technical College	AL
University of Arkansas at Pine Bluff	AR
California Polytechnic State University-Pomona	CA
California State University-Chico	CA
California State University-Fresno	CA
California State University-Fullerton	CA
California State University-Hayward	CA
California State University-Long Beach	CA
Humboldt State University	CA
San Jose State University	CA
University of the District of Columbia	DC
Delaware State College	DE
Albany State College	GA
Fort Valley State College	GA
Southern Illinois University at Edwardsville	IL
Western Illinois University	IL
Kentucky State University	KY
Morehead State University	KY
Murray State University	KY
Southern University and A&M College at Baton Rouge	LA

Public, nondoctorate-granting institutions

Institution name	*State*
University of Massachusetts Dartmouth	MA
Coppin State College	MD
Morgan State University	MD
Towson State University	MD
University of Maryland Eastern Shore	MD
Grand Valley State University	MI
Northern Michigan University	MI
Mankato State University	MN
Lincoln University	MO
Northeast Missouri State University	MO
Alcorn State University	MS
Delta State University	MS
Jackson State University	MS
Mississippi Valley State University	MS
North Carolina Agricultural & Technical State University	NC
North Carolina Central University	NC
University of North Carolina at Charlotte	NC
Winston-Salem State University	NC
Eastern New Mexico University	NM
University of Nevada-Las Vegas	NV
City University of New York College of Staten Island	NY
City University of New York Queens College	NY
City University of New York York College	NY

Public, nondoctorate-granting institutions

Institution name	*State*
State University of New York College at Brockport	NY
State University of New York College at Buffalo	NY
State University of New York College at Geneseo	NY
Central State University	OH
Langston University	OK
Western Oregon State College	OR
California University of Pennsylvania	PA
Clarion University of Pennsylvania	PA
East Stroudsburg University of Pennsylvania	PA
Edinboro University of Pennsylvania	PA
Lincoln University	PA
South Carolina State College	SC
Winthrop College	SC
Prairie View A & M University	TX
Texas A & I University	TX
Texas Southern University	TX
University of Houston-Clear Lake	TX
West Texas State University	TX
James Madison University	VA
Norfolk State University	VA
Virginia Military Institute	VA
Virginia State University	VA
University of the Virgin Islands	VI

Public, nondoctorate-granting institutions

Institution name	*State*
Central Washington University	WA
Eastern Washington University	WA
University of Wisconsin-Green Bay	WI
University of Wisconsin-Parkside	WI
University of Wisconsin-River Falls	WI
University of Wisconsin-Stout	WI
Marshall University	WV

Private, nondoctorate-granting institutions

Institution name	*State*
Oakwood College	AL
Selma University	AL
Tuskegee University	AL
Chapman University	CA
Harvey Mudd College	CA
Occidental College	CA
Pomona College	CA
Colorado College	CO
Connecticut College	CT
Quinnipiac College	CT
Rollins College	FL
Morehouse College	GA
Grinnell College	IA
Knox College	IL
DePauw University	IN
Valparaiso University	IN
Dillard University	LA
Loyola University	LA
Amherst College	MA
Emmanuel College	MA
Mount Holyoke College	MA
Regis College	MA

Private, nondoctorate-granting institutions

Institution name	*State*
Wellesley College	MA
Wentworth Institute of Technology	MA
Williams College	MA
Goucher College	MD
Bowdoin College	ME
Carleton College	MN
St. Mary's College	MN
Tougaloo College	MS
Johnson C. Smith University	NC
Monmouth College	NJ
Barnard College	NY
Ithaca College	NY
Manhattan College	NY
Vassar College	NY
Webb Institute of Naval Architecture	NY
College of Wooster	OH
Xavier University	OH
Reed College	OR
University of Portland	OR
Bucknell University	PA
Franklin and Marshall College	PA
Haverford College	PA
Swarthmore College	PA

Private, nondoctorate-granting institutions

Institution name	*State*
Widener University	PA
Fisk University	TN
St. Mary's University San Antonio	TX
Hampton University	VA
Middlebury College	VT
Pacific Lutheran University	WA
Beloit College	WI
Lawrence University	WI
Milwaukee School of Engineering	WI

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Historically Black Colleges and Universities

Institution name	*State*
Alabama Agricultural and Mechanical University	AL
Alabama State University	AL
Trenholm State Technical College	AL
Oakwood College	AL
Selma University	AL
Tuskegee University	AL
University of Arkansas at Pine Bluff	AR
Howard University	DC
University of the District of Columbia	DC
Delaware State College	DE
Florida A & M University	FL
Clark Atlanta University	GA
Morehouse School of Medicine	GA
Albany State College	GA
Fort Valley State College	GA
Morehouse College	GA
Kentucky State University	KY
Grambling State University	LA
Xavier University of Louisiana	LA
Southern University and A&M College at Baton Rouge	LA
Dillard University	LA
Coppin State College	MD

Historically Black Colleges and Universities

Institution name	*State*
Morgan State University	MD
University of Maryland Eastern Shore	MD
Lincoln University	MO
Alcorn State University	MS
Jackson State University	MS
Mississippi Valley State University	MS
Tougaloo College	MS
North Carolina Agricultural & Technical State University	NC
North Carolina Central University	NC
Winston-Salem State University	NC
Johnson C. Smith University	NC
Central State University	OH
Langston University	OK
Lincoln University	PA
South Carolina State College	SC
Tennessee State University	TN
Meharry Medical College	TN
Fisk University	TN
Prairie View A & M University	TX
Texas Southern University	TX
Norfolk State University	VA
Virginia State University	VA
Hampton University	VA

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Historically Black Colleges and Universities

Institution name	*State*
University of the Virgin Islands	VI

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Appendix C

Survey Questionnaire

OMB # 3145-0101
Expires 9/30/98

1996 SURVEY OF SCIENTIFIC AND ENGINEERING RESEARCH FACILITIES AT UNIVERSITIES AND COLLEGES

NATIONAL SCIENCE FOUNDATION (NSF)
NATIONAL INSTITUTES OF HEALTH (NIH)

Acting out of concerns raised by the academic community, Congress directed the National Science Foundation (NSF) to collect and analyze data about research facilities at universities and colleges and to report to Congress every two years. This survey is in response to that requirement under authorization of the National Science Foundation Act of 1950, as amended.

The format of the survey has changed somewhat from the 1994 version, resulting in some additional pages, but in little additional burden to you, the respondent. The main topics in this year's survey are:

- amount of space in your institution;
- amount and condition of research space in your institution;
- costs of capital projects completed, begun, or planned;
- deferred capital projects; and
- miscellaneous topics.

We will use the information that you provide for a report that gives a broad, quantitative picture of

- the cost, availability, and condition of existing science and engineering (S&E) research facilities; and
- the current capital spending by universities and colleges, sources of funding, and plans for future repair/renovation and new construction of S&E research facilities.

The report is used by Congress, many higher education associations, and university and college administrators to help make policy decisions. Your participation in this survey is voluntary. **NSF and NIH do not use or allow other agencies to use the information from this survey to affect individual institutional funding, nor will detailed responses be used in any manner that would identify an individual institution's responses.**

The president or chancellor of your institution named the individual on the label below to coordinate data collection for this survey. Please correct any wrong information on the label.

Label

If someone other than the person listed above coordinates the data collection, please tell us whom we may call if we have questions about the information.

Name	**Title/Department**	**Telephone no. and ext.**

Completing this survey requires an average of 24 hours. If you wish to comment on this burden, contact Herman Fleming, Reports Clearance Officer, NSF, at 703-306-1243, and the Office of Management and Budget, Paperwork Reduction Project (OMB Number 3145-0101), Washington, DC 20503.

Return the completed survey by ***December 1, 1995,*** to

The Gallup Organization
Attention: Dr. Jennifer Spielvogel
One Church Street, Suite 900
Rockville, MD 20850

If you have any questions or comments about the survey, contact Dr. Ann Lanier of NSF at 703-306-1774 or Dr. Jennifer Spielvogel of The Gallup Organization at 1-800-288-9439 (spieja@gallup.com).

GUIDELINES

Refer to these guidelines as you fill out the survey.

1. About this survey—how to use the "Tips" box

With each item in this survey, along with instructions for completing the item, you will find a "Tips" box containing additional information to help you complete the item correctly. The box also contains definitions of terms that appear in the item. Terms appearing in **boldface type** in the instructions are defined in the "Tips" box on that page.

2. The definition of research

In this survey, research is defined as all research activities of your institution that are budgeted and accounted for. Research can be funded by the institution itself, the Federal government, state governments, foundations, corporations, or other sources.

3. What to include as research facilities

In this survey, the term "research facilities" includes

- research laboratories;
- controlled-environment space, such as clean or white rooms;
- technical-support space, such as carpentry and machine shops;
- facilities for laboratory animals, such as animal production colonies, holding rooms, isolation and germ-free rooms;
- faculty or staff offices, to the extent that they are used for research;
- department libraries, to the extent that they are used for research;
- fixed (built-in) equipment, such as fume hoods and benches; and
- non-fixed equipment costing $1 million or more.

It does* not *include

- facilities that have been designated as federally funded research and development centers (FFRDC);
- facilities that are used by faculty, but are not administered by the institution, such as research space at Veterans Administration or other non-university hospitals.

4. What fields to include as science and engineering (S&E) fields

Because every institution has its own way of classifying fields of study, for consistency, please use the *Cross Reference* chart (see page 24) to classify areas of study at your institution. The *Cross Reference* chart identifies the departments that are included within each of the S&E fields used in this survey. The *Cross Reference* chart is based on the classification of academic departments used by the National Center for Educational Statistics. If you are unable to separate data for academic departments, report the combined data under "Other Sciences, not elsewhere classified" and list the fields that those data represent.

For this survey, S&E fields include

- Engineering
- Physical Sciences
- Earth, Atmospheric, and Ocean Sciences (formerly Environmental Sciences)
- Mathematics
- Computer Sciences
- Agricultural Sciences
- Biological Sciences
- Medical Sciences
- Psychology
- Social Sciences
- Other Sciences, not elsewhere classified

They do* not *include

- law, business administration/management (except economics), humanities, history, the arts, or education (except educational psychology).

5. The definition of net assignable square feet (NASF)

In this survey, NASF is defined as the sum of all areas (in square feet) on all floors of a building assigned to, or available to be assigned to, an occupant for specific use, such as instruction or research. NASF should be measured from the inside faces of walls. Refer to pages 95–96 in Appendix 2 of *Postsecondary Education Facilities Inventory and Classification Manual*, U.S. Department of Education, Office of Educational Research and Improvement, NCES 92-165 (or to the 1988 NACUBO *Taxonomy of Functions*, or to the 1972 WICHE *Program Classification Structure*).

6. How to calculate space and cost

Space in NASF

For space used for both S&E research and other purposes: *Prorate* the NASF to reflect the proportion of use for S&E research activity. For example, if a room or building is used for S&E research only during the summer months (one-fourth of the year), then count 25% of the NASF as S&E research space.

For space that is shared by S&E fields: Prorate the NASF to reflect the proportion of use by each field. For example, if a room or building is used equally for research activity in Computer Sciences and Mathematics, count 50% of the NASF as research space for Computer Sciences and 50% for Mathematics.

Cost of repair/renovation and new construction

What to include under "completion costs": Several survey items ask you to report completion costs for repair/ renovation and new construction projects. When you report completion costs for projects on S&E research space, include costs for

- planning;
- site preparation; and
- repair/renovation or new construction of
  - the research space itself;
  - fixed equipment;
  - non-fixed equipment costing $1 million or more; and
  - building infrastructure, such as plumbing, lighting, air exchange, and safety systems in the building and within five feet of the building foundation.

For projects involving both S&E research space and space used for other purposes: Prorate the cost of repair/ renovation and new construction projects to reflect the proportion of the space that is used for S&E research. For example, you might construct a new Biological Sciences building at a cost of $8 million. Half of the space in the new building will be used for biological research and the other half will be used for class instruction. In this case, the prorated cost of construction for S&E research facilities that you should report would be $4 million, or half of the total cost.

For multi-year projects: Allocate the entire project completion cost to the fiscal year in which the project began or is expected to begin. Consider the start-date for a project to be the date on which repair/renovation or new construction actually began or is expected to begin.

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AMOUNT OF SPACE IN YOUR INSTITUTION

Item 1a. Instructional and research space

To complete Item 1a, do the following:

❶ In Column 1 of the table on the facing page, fill in the current amount of net assignable square feet (**NASF**) devoted to instruction and **research** for each field listed.

❷ Near the bottom of Column 1, fill in the current total NASF devoted to instruction and research for

- science and engineering (S&E) fields (TOTAL #1),
- non-science fields (TOTAL #2), and
- all academic fields (TOTAL #3).

❸ In Column 2, fill in the current amount of **research space** (NASF devoted to research only) for each S&E field listed.

❹ Near the bottom of Column 2, fill in the total NASF devoted to research in all S&E fields.

Note for institutions using a facilities inventory system based on NCES, NACUBO, or WICHE classifications:

> For Column 1 ("Instructional and research NASF"), add the space that is assigned to functional category 1 (Instruction) and category 2 (Research). For Column 2 ("Research NASF"), use only the space that is assigned to functional category 2 (Research). Please refer to pages 95–96 in Appendix 2 of *Postsecondary Education Facilities Inventory and Classification Manual*, U.S. Department of Education, Office of Educational Research and Improvement, NCES 92-165 (or to the 1988 NACUBO *Taxonomy of Functions*, or to the 1972 WICHE *Program Classification Structure*).

Tips for completing Item 1a

- ➢ Include space leased by your institution.
- ➢ Estimate if exact figures are not available.
- ➢ If space is used for more than one purpose, prorate the NASF to reflect the proportion of use for the activity the item is asking about. (For an example, see page 3.)
- ➢ If space is shared by S&E fields, prorate the NASF to reflect the proportion of use by each field. (For an example, see page 3.)
- ➢ Note that the disciplinary field listed as "Environmental Sciences" in prior years' surveys is now listed as "Earth, Atmospheric, and Ocean Sciences."
- ➢ For help in classifying your programs, refer to the *Cross Reference* chart on page 24.
- ➢ Use these definitions for bolded items:

NASF: Is the sum of all areas (in square feet) on all floors of a building assigned to, or available to be assigned to, an occupant for specific use, such as instruction or research. NASF should be measured from the inside faces of walls.

research: Refers to all research activities of an institution that are budgeted and accounted for. Research can be funded by the institution itself, the Federal government, state governments, foundations, corporations, or other sources.

research space: Refers to the NASF of space in facilities within which research activities take place. These facilities may include the following (to the extent that they are used for research): research laboratories, controlled-environment space, technical-support space, facilities for laboratory animals, faculty or staff offices, department libraries, fixed equipment (such as fume hoods and benches), and non-fixed equipment costing $1 million or more.

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Table for Item 1a. Instructional and research space

Field	Column 1 Instructional and research NASF	Column 2 Research NASF
SCIENCE AND ENGINEERING (S&E) FIELDS	▨	▨
Engineering		
Physical Sciences		
Earth, Atmospheric, and Ocean Sciences (formerly Environmental Sciences)		
Mathematics		
Computer Sciences		
Agricultural Sciences		
Biological Sciences Other than medical school		
Biological Sciences Medical school		
Medical Sciences Other than medical school		
Medical Sciences Medical school		
Psychology		
Social Sciences		
Other Sciences, not elsewhere classified List them:		
TOTAL #1: ALL S&E FIELDS		
TOTAL #2: ALL NON-SCIENCE FIELDS [for example, law, business administration/management (except economics), humanities, history, the arts, or education (except educational psychology)]		▨
TOTAL #3: GRAND TOTAL		▨

Item 1b. Leased research space

Look at the total research space for all S&E fields (TOTAL #1) in the table above. How much of that space is leased?

______________ **NASF of leased research space**

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AMOUNT AND CONDITION OF RESEARCH SPACE

Item 2. Current amount of research space, by field

Item 2 asks you to rate the amount of science and engineering (S&E) **research space** available at your institution. For each field, you will choose one of the following three categories:

A *Adequate amount of space:* sufficient to support all the needs of your current S&E **research program commitments** in the field

B *Inadequate amount of space:* not sufficient to support the needs of your current S&E research program commitments in the field; or non-existent but needed

NA Not applicable or no space needed in the field

To complete Item 2, do the following:

❶ For each field listed on the table on the facing page, circle the letter of the category in Column 1 that best describes the amount of space available for your current S&E research program commitments in that field.

❷ For each field for which you circled **B** (inadequate amount), estimate and record in Column 2 the additional NASF or percent more space that is needed.

Example 1: The Engineering department's research space is overcrowded to the extent that efficiency of work on an existing grant has been affected. In your answer to Item 2, you should consider the additional space you need to support work on this already awarded grant.

Example 2: The Biology department has made offers to three new faculty needed to support an existing program in molecular biology. In your answer to Item 2, you should consider the space needed to accommodate these new colleagues (even though they are not currently on campus) because it is needed to fulfill already existing program commitments and because offers have been made.

Tips for completing Item 2

➢ Use these definitions for bolded items:

research program commitments: Refers to all research and development activities of an institution that are budgeted, approved, and funded. Research program commitments include

- current *faculty and staff* or those to whom offers have been made;
- *grants* awarded, whether or not research has actually begun; and
- *programs* which have been approved.

They do *not* include

- potential staff without offers,
- grants applied for but not awarded, and
- programs designed but not yet approved.

research space: Refers to the NASF of space in facilities within which research activities take place. These facilities may include the following (to the extent that they are used for research): research laboratories, controlled-environment space, technical-support space, facilities for laboratory animals, faculty or staff offices, department libraries, fixed equipment (such as fume hoods and benches), and non-fixed equipment costing $1 million or more.

Table for Item 2. Current amount of research space, by field

Key:

A =	***Adequate*** *amount of space:*	*sufficient to support all the needs of your current S&E research program commitments in the field*
B =	***Inadequate*** *amount of space:*	*not sufficient to support the needs of your current S&E research program commitments in the field; or non-existent but needed*
NA =	*Not applicable or no space needed in the field*	

	Column 1			**Column 2**	
	Adequacy or inadequacy of amount of S&E research space *For each field, circle the appropriate code in one of the columns below.*			**Additional space needed for current S&E research program commitments** *For each field, you may choose to enter* ***either*** *NASF* ***or*** *percent more space needed. (Enter a figure in* ***one*** *of the columns below for each field.)*	
Field	**Adequate**	**Inadequate**	**Not Applicable**	**Additional NASF needed**	**Percent more space needed**
Engineering	A	B	NA		
Physical Sciences	A	B	NA		
Earth, Atmospheric, and Ocean Sciences (formerly Environmental Sciences)	A	B	NA		
Mathematics	A	B	NA		
Computer Sciences	A	B	NA		
Agricultural Sciences	A	B	NA		
Biological Sciences Other than medical school	A	B	NA		
Biological Sciences Medical school	A	B	NA		
Medical Sciences Other than medical school	A	B	NA		
Medical Sciences Medical school	A	B	NA		
Psychology	A	B	NA		
Social Sciences	A	B	NA		
Other Sciences, not elsewhere classified List them:	A	B	NA		

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Item 3. Current condition of research space, by field

To complete Item 3, do the following:

❶ For each field listed on the table on the facing page, fill in the percent of **research space** that falls into each category below:

A	Suitable for the most scientifically competitive research in the field
B	Effective for most levels of research in the field, but may need limited repair/renovation
C	Requires **major renovation** or replacement to be used effectively
NA	Not applicable or no research space in that field

❷ For each field for which you reported space in category C, record in Column 2 the number of NASF or percent of that space that is funded and scheduled to undergo major renovation or replacement in your FY 1996 or FY 1997.

Tips for completing Item 3

- ➢ Consider only space supporting your *current* S&E research program commitments.
- ➢ Use these definitions for bolded items:

major renovation: Refers to an extensive repair project that results in facilities that are equivalent, or nearly equivalent, to new facilities in their ability to support S&E research.

research space: Refers to the NASF of space in facilities within which research activities take place. These facilities may include the following (to the extent that they are used for research): research laboratories, controlled-environment space, technical-support space, facilities for laboratory animals, faculty or staff offices, department libraries, fixed equipment (such as fume hoods and benches), and non-fixed equipment costing $1 million or more.

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Table for Item 3. Current condition of research space, by field

Key:

A = *Suitable for the most scientifically competitive research in the field*

B= *Effective for most levels of research in the field, but may need limited repair/renovation (Includes categories B and C from 1994 survey)*

C = *Requires major renovation or replacement to be used effectively (Includes categories D and E from 1994 survey)*

NA = *Not applicable or no research space in this field*

	Column 1					Column 2	
	Percent of research space according to condition					Amount of space in category C that is funded and scheduled to undergo major renovation or replacement in your FY 1996 or FY 1997 *For each field, you may choose to enter **either** NASF **or** percent of space. (Enter a figure in **one** of the columns below for each field.)*	
Field	**A**	**B**	**C**	**Total**	**NA**	**NASF**	**Percent of space**
Engineering				100%			
Physical Sciences				100%			
Earth, Atmospheric, and Ocean Sciences (formerly Environmental Sciences)				100%			
Mathematics				100%			
Computer Sciences				100%			
Agricultural Sciences				100%			
Biological Sciences Other than medical school				100%			
Biological Sciences Medical school				100%			
Medical Sciences Other than medical school				100%			
Medical Sciences Medical school				100%			
Psychology				100%			
Social Sciences				100%			
Other Sciences, not elsewhere classified List them:				100%			

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COSTS OF CAPITAL PROJECTS COMPLETED, BEGUN, OR PLANNED

Item 4a. Research facilities projects over $100,000: your FY 1994 and FY 1995

This item asks you to report the completion costs (planning, site preparation, construction, **fixed equipment**, non-fixed equipment costing $1 million or more, **building infrastructure**) and net assignable square feet (**NASF**) involved in **repair/renovation** and **new construction** of science and engineering (S&E) research facilities.

To complete Item 4a, do the following:

❶ In Columns 1 and 3 of the table on the facing page,

- for each field listed, fill in the completion costs for repair/renovation and new construction projects over $100,000, and
- in the row marked TOTAL, fill in the total completion costs for repair/renovation and new construction.

❷ In Columns 2 and 4 of the table on the facing page,

- for each field listed, fill in the estimated NASF involved in repair/renovation and new construction projects over $100,000, and
- in the row marked TOTAL, fill in the estimated total NASF for repair/renovation and new construction.

Tips for completing Item 4a

➢ Consider only projects that began during your FY 1994 or FY 1995. (Consider the start-date for a project to be the date on which repair/renovation or new construction actually began.)

➢ If space is shared by S&E fields, prorate the NASF and cost to reflect the proportion of use by each field. (For an example, see page 3.)

➢ Consider only projects whose prorated cost in a given field is over $100,000. (All the dollar figures in Column 1 or Column 3 of the table on the facing page should be *over $100,000.*)

➢ Use these definitions for bolded items:

building infrastructure: Includes systems that exist in the building and within five feet of the building foundation, such as plumbing, lighting, air exchange, and safety systems.

fixed equipment: Refers to equipment that is built into facilities, such as fume hoods and lab benches.

NASF: Is the sum of all areas (in square feet) on all floors of a building assigned to, or available to be assigned to, an occupant for specific use, such as instruction or research. NASF should be measured from the inside faces of walls.

new construction: Refers to additions to an existing building or construction of a new building.

repair/renovation: Refers to the fixing up of facilities in deteriorated condition, capital improvements on facilities, conversion of facilities, etc.

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Table for Item 4a. Research facilities projects over $100,000: your FY 1994 and FY 1995

Field	REPAIR/RENOVATION over $100,000 begun during your FY 1994 or FY 1995		NEW CONSTRUCTION over $100,000 begun during your FY 1994 or FY 1995	
	Column 1	Column 2	Column 3	Column 4
	Cost	NASF	Cost	NASF
Engineering				
Physical Sciences				
Earth, Atmospheric, and Ocean Sciences (formerly Environmental Sciences)				
Mathematics				
Computer Sciences				
Agricultural Sciences				
Biological Sciences Other than medical school				
Biological Sciences Medical school				
Medical Sciences Other than medical school				
Medical Sciences Medical school				
Psychology				
Social Sciences				
Other Sciences, not elsewhere classified List them:				
TOTAL				

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Item 4b. Research facilities projects between $5,000 and $100,000: your FY 1994 and FY 1995

To complete Item 4b, do the following:

In the blank below, fill in the total dollar amount for completion costs of **repair/renovation** projects between $5,000 and $100,000 begun in your FY 1994 and FY 1995.

Total for repair/renovation projects (costing between $5,000 and $100,000 each) of your science and engineering (S&E) research facilities **$** _____________

Tips for completing Item 4b

- Consider only projects that began during your FY 1994 or FY 1995. (Consider the start-date for a project to be the date on which repair/renovation or new construction actually began.)
- Include projects to repair/renovate **fixed equipment**, non-fixed equipment costing $1 million or more, and **building infrastructure**.
- Exclude projects whose prorated cost is less than $5,000 or more than $100,000.
- Use these definitions for bolded items:

building infrastructure: Includes systems that exist in the building and within five feet of the building foundation, such as plumbing, lighting, air exchange, and safety systems.

fixed equipment: Refers to equipment that is built into facilities, such as fume hoods and lab benches.

repair/renovation: Refers to the fixing up of facilities in deteriorated condition, capital improvements on facilities, conversion of facilities, etc.

Go to the next page.

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Item 5. Sources of funding for research facilities projects: your FY 1994 and FY 1995

To complete Item 5, do the following:

❶ In the row marked TOTAL on the table on the facing page, at the bottom of Columns 1 and 2, copy the cost totals for your science and engineering (S&E) research facilities projects from Item 4a, Columns 1 and 3:

- **repair/renovation** projects costing over $100,000, and
- **new construction** projects costing over $100,000.

❷ Fill in the dollar amounts of funding from each source listed.

Tips for completing Item 5

- ➢ Consider only projects that began during your FY 1994 or FY 1995. (Consider the start-date for a project to be the date on which repair/renovation or new construction actually began.)
- ➢ Note that "Institutional funds" include operating funds, endowments, indirect costs recovered from federal grants and/or contracts, indirect costs recovered from other sources, etc.
- ➢ Use these definitions for bolded items:

new construction: Refers to additions to an existing building or construction of a new building.

repair/renovation: Refers to the fixing up of facilities in deteriorated condition, capital improvements on facilities, conversion of facilities, etc.

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Table for Item 5. Sources of funding for research facilities projects: your FY 1994 and FY 1995

	Column 1 Dollar amount for REPAIR/RENOVATION projects costing over $100,000	Column 2 Dollar amount for NEW CONSTRUCTION projects costing over $100,000
Federal government		
State or local government		
Private donations		
Institutional funds (Operating funds, endowments, indirect costs recovered from federal grants and/or contracts, indirect costs recovered from other sources, etc.)		
Tax-exempt bonds		
Other debt financing		
Other sources List them		
TOTAL		

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Item 6. Planned research facilities projects over $100,000 scheduled to begin in your FY 1996 and FY 1997

To complete Item 6, do the following:

❶ In Columns 1 and 3 of the table on the facing page,

- for each field listed, fill in the completion costs for projects over $100,000 (planning, site preparation, construction, **fixed equipment**, non-fixed equipment costing $1 million or more, **building infrastructure**) for **planned projects** (both **repair/renovation** and **new construction**), and
- in the row marked TOTAL #1, fill in the total completion costs for all science and engineering (S&E) fields.

❷ In Columns 2 and 4,

- for each field listed, estimate the net assignable square feet (**NASF**) involved in those projects (***Note:*** *be sure to include here any space that you reported in Column 2 of the table for Item 3)*, and
- in the row marked TOTAL #1, fill in the estimated NASF for all S&E fields.

❸ Near the bottom of the table, in the row marked TOTAL #2, enter the estimated completion costs for planned capital projects to extend, repair, or renovate **central campus infrastructure**.

❹ Add the figures in the row marked TOTAL #1 to those in the row marked TOTAL #2. Record the total figures in the row marked TOTAL #3.

Tips for completing Item 6

➢ Consider only projects scheduled to begin during your FY 1996 or FY 1997.

➢ If space is shared by S&E fields, prorate the NASF and cost to reflect the proportion of use by each field. (For an example, see page 3.)

➢ Include only projects whose prorated cost in a given field is over $100,000. (All the dollar figures in Column 1 or Column 3 of the table on the facing page should be *over $100,000.*)

➢ Estimate if exact figures are not available.

➢ Use these definitions for bolded items:

building infrastructure: Includes systems that exist in the building and within five feet of the building foundation, such as plumbing, lighting, air exchange, and safety systems.

central campus infrastructure: Refers primarily to systems that exist between the buildings of a campus (excluding the area within five feet of any individual building foundation) and to the nonarchitectural elements of campus design (central wiring for telecommunications systems, storage/disposal facilities, electrical wiring between buildings, central heating and air exchange systems, drains and sewers, roadways, walkways, parking systems, etc.)

fixed equipment: Refers to equipment that is built into facilities, such as fume hoods and lab benches.

NASF: Is the sum of all areas (in square feet) on all floors of a building assigned to, or available to be assigned to, an occupant for specific use, such as instruction or research. NASF should be measured from the inside faces of walls.

new construction: Refers to additions to an existing building or construction of a new building.

planned project: Refers to a project that is funded and scheduled but on which construction has not yet begun.

repair/renovation: Refers to the fixing up of facilities in deteriorated condition, capital improvements on facilities, conversion of facilities, etc.

Table for Item 6. Planned research facilities projects over $100,000 scheduled to begin in your FY 1996 and FY 1997

Field	REPAIR/RENOVATION over $100,000 scheduled to begin in your FY 1996 or FY 1997		NEW CONSTRUCTION over $100,000 scheduled to begin in your FY 1996 or FY 1997	
	Column 1 Expected Cost	Column 2 Estimated NASF	Column 3 Expected Cost	Column 4 Estimated NASF
Engineering				
Physical Sciences				
Earth, Atmospheric, and Ocean Sciences (formerly Environmental Sciences)				
Mathematics				
Computer Sciences				
Agricultural Sciences				
Biological Sciences Other than medical school				
Biological Sciences Medical school				
Medical Sciences Other than medical school				
Medical Sciences Medical school				
Psychology				
Social Sciences				
Other Sciences, not elsewhere classified List them:				
TOTAL #1: ALL S&E FIELDS				
TOTAL #2: CENTRAL CAMPUS INFRASTRUCTURE (Includes telecommunications, electrical systems, plumbing systems, steam and chilled water lines, hazardous materials systems, etc.)		▨		▨
TOTAL #3: GRAND TOTAL		▨		▨

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DEFERRED CAPITAL PROJECTS

Item 7. Costs for repair/renovation and new construction of research space needed but not funded

To complete Item 7, do the following:

❶ Read the definition in the "Tips" box to the right for **deferred project**. According to this definition, does your institution have any deferred projects for **repair/renovation** or **new construction** of your science and engineering (S&E) research facilities?

☐ Yes. Go to step ❷.
☐ No. Go to Item 8 (see page 20).

❷ Read the definition in the "Tips" box to the right for **institutional plan**. Then,

- for deferred projects that are *part of an institutional plan*, enter the estimated completion costs (planning, site preparation, construction, **fixed equipment**, non-fixed equipment costing $1 million or more, **building infrastructure**) in Columns 1 and 2 of the table on the facing page; and
- for deferred projects that are *not* part of an institutional plan, enter the estimated completion costs in Columns 3 and 4.

❸ Record the totals for these estimates in the row marked TOTAL #1.

❹ Near the bottom of the table, in the row marked TOTAL #2, enter the estimated completion costs for deferred capital projects to extend, repair, or renovate **central campus infrastructure**—both those that are, and those that are not, part of an institutional plan.

❺ Add the figures in the row marked TOTAL #1 to those in the row marked TOTAL #2. Record the total figures in the row marked TOTAL #3.

Tips for completing Item 7

➢ If space is shared by S&E fields, prorate the cost to reflect the proportion of use by each field. (For an example, see page 3.)

➢ For help in classifying your programs, refer to the *Cross Reference* chart on page 24.

➢ Use these definitions for bolded items:

building infrastructure: Includes systems that exist in the building and within five feet of the building foundation, such as plumbing, lighting, air exchange, and safety systems.

central campus infrastructure: Refers primarily to systems that exist between the buildings of a campus (excluding the area within five feet of any individual building foundation) and to the nonarchitectural elements of campus design (central wiring for telecommunications systems, storage/disposal facilities, electrical wiring between buildings, central heating and air exchange systems, drains and sewers, roadways, walkways, parking systems, etc.)

deferred project: Refers to a repair/renovation or new construction project which meets all of the following criteria:

- is necessary to meet your current S&E research program commitments,
- is not scheduled for your FY 1996 or FY 1997,
- does not have funding, *and*
- is neither for the purpose of developing new programs nor for expanding faculty beyond what is required to fulfill current S&E research program commitments.

fixed equipment: Refers to equipment that is built into facilities, such as fume hoods and lab benches.

institutional plan: Refers to an institution's approved plan, including goals, strategies, steps, and budgets, for fulfilling the institution's mission during a specific time period.

new construction: Refers to additions to an existing building or construction of a new building.

repair/renovation: Refers to the fixing up of facilities in deteriorated condition, capital improvements on facilities, conversion of facilities, etc.

Table for Item 7. Costs for repair/renovation and new construction of research space needed but not funded

Note: *If you cannot provide cost estimates,* ***you may instead record estimated NASF*** *for deferred projects (prorate if necessary). If you choose to do this and are recording NASF rather than dollars in the table below, check (✓) here:* ☐

Field	Estimated cost for deferred projects needed for current S&E research program commitments			
	Needs INCLUDED in an institutional plan		Needs NOT INCLUDED in an institutional plan	
	Column 1 Repair/renovation costs	Column 2 New construction costs	Column 3 Repair/renovation costs	Column 4 New construction costs
Engineering				
Physical Sciences				
Earth, Atmospheric, and Ocean Sciences (formerly Environmental Sciences)				
Mathematics				
Computer Sciences				
Agricultural Sciences				
Biological Sciences Other than medical school				
Biological Sciences Medical school				
Medical Sciences Other than medical school				
Medical Sciences Medical school				
Psychology				
Social Sciences				
Other Sciences, not elsewhere classified List them:				
TOTAL #1: ALL S&E FIELDS				
TOTAL #2: CENTRAL CAMPUS INFRASTRUCTURE (Includes telecommunications, electrical systems, plumbing systems, steam and chilled water lines, hazardous materials systems, etc.)				
TOTAL #3: GRAND TOTAL				

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MISCELLANEOUS ITEMS

Item 8. Facilities for laboratory animals

To complete Item 8, answer the following:

❶ Does your institution have facilities for laboratory animals?

☐ No. Go to Item 9 on the next page.

☐ Yes. Go to step ❷.

❷ Below, fill in the amounts of your **animal housing NASF** and **animal laboratory NASF**. Add the two figures to arrive at your **total animal research NASF**.

	Animal housing NASF	__________
+	Animal laboratory NASF	__________
=	Total animal research NASF	__________

❸ Fill in the amounts of your total animal research NASF that

- fully meets government regulations __________ NASF
- needs limited repair/renovation to meet government regulations __________ NASF
- needs major repair/renovation or replacement to meet government regulations __________ NASF

The total of the three categories above should equal the total animal research NASF in ❷.

❹ Fill in the costs and amounts of NASF for animal facility improvements involving

- repair/renovation over $100,000 scheduled to begin in your FY 1996 or FY 1997

  Cost __________ NASF__________
- new construction over $100,000 scheduled to begin in your FY 1996 or FY 1997

  Cost __________ NASF__________

Note: *Be sure to also include in your answer to Item 6 on page 17 any projects you include in your answer to* ❹ *above.*

Tips for completing Item 8

➢ Include as laboratory animal facilities both departmental and central facilities that are subject to government and state policies and regulations concerning humane care and use of laboratory animals.

➢ Do *not* include in your lab animal facilities space:

- agricultural field buildings sheltering animals that do not directly support research or that are not subject to government regulations concerning humane care and use of laboratory animals; or
- areas for treatment of animals that are veterinary patients.

➢ Use these definitions for bolded items:

animal housing NASF: Refers to all general animal housing (for example, cage rooms, stalls, wards, isolation rooms) and maintenance areas (for example, feed storage rooms, cage-washing rooms, shops, storage), if these areas directly support research. (Animal housing NASF are Codes 570 and 575 in the *Postsecondary Education Facilities Inventory and Classification Manual.*)

animal laboratory NASF: Refers to all animal laboratory space used exclusively for research activities, such as bench space, animal production colonies, holding rooms, germ-free rooms, surgical facilities and recovery rooms.

total animal research NASF: Refers to the combined amount of animal laboratory and animal housing NASF. (Total animal research NASF is equivalent to the term "Research NASF" in Item #10 of the 1994 survey.)

Item 9. Limit on tax-exempt bonds

To complete Item 9, answer the following questions:

❶ Is your institution a private college or university?

☐ No. Go to Item 10 on the next page.

☐ Yes. Go to step ❷.

❷ Federal tax reform legislation established a limit on tax-exempt bonds of $150 million per private college or university.

Has your institution reached the limit on tax-exempt bonds?

☐ Yes.

☐ No, but we expect to within the next two fiscal years.

☐ No, and we do not expect to within the next two fiscal years.

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Item 10. Additional comments

This is an optional, open-ended question designed with two purposes in mind. It allows you to

- give us information which numerical data cannot capture, and
- help us identify new areas of concern relating to science and engineering (S&E) research facilities. Such discoveries may, in future surveys, warrant further quantitative investigation.

To complete Item 10, write any additional comments you may have in the space below:

FICE Code

Institution Name

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Item 11. Feedback

We appreciate the time you have taken to fill out the 1996 survey.

How many person-hours were required to complete this form? ________________

Return the survey by ***December 1, 1995***, to

The Gallup Organization
Attention: Dr. Jennifer Spielvogel
One Church Street, Suite 900
Rockville, MD 20850

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CROSS REFERENCE BETWEEN NSF FIELD CATEGORIES AND THE NCES CLASSIFICATION OF ACADEMIC DEPARTMENTS

Use this chart to identify the departments that are included within each of the science and engineering (S&E) fields used in this survey.

ENGINEERING

101	Aerospace Engineering		
		14.02	Aerospace, aeronautical, and astronautical engineering
102	Agricultural Engineering		
		14.03	Agricultural engineering
103	Biomedical Engineering		
		14.05	Bioengineering and biomedical engineering
104	Chemical Engineering		
		03.0509	Wood sciences
		14.07	Chemical engineering
105	Civil Engineering		
		04.02	Architecture
		14.04	Architectural engineering
		14.08	Civil engineering
		14.14	Environmental health engineering
106	Electrical Engineering		
		14.09	Computer engineering
		14.10	Electrical, electronics, and communications engineering
		14.1002	Microelectronic engineering
107	Engineering Science		
		14.12	Engineering physics
		14.13	Engineering science
108	Industrial Engineering/Management Science		
		14.17	Industrial engineering
		14.27	Systems engineering
		30.06	Systems science
109	Mechanical Engineering		
		14.11	Engineering mechanics
		14.19	Mechanical engineering
110	Metallurgical and Materials Engineering		
		14.06	Ceramic engineering
		14.18	Materials engineering
		14.20	Metallurgical engineering
		40.0701	Metallurgy
111	Mining Engineering		
		14.15	Geological engineering
		14.16	Geophysical engineering
		14.21	Mining and mineral engineering
112	Nuclear Engineering		
		14.23	Nuclear engineering
113	Petroleum Engineering		
		14.25	Petroleum engineering
114	Engineering, not elsewhere classified		
		14.01	Engineering, general
		14.22	Naval architecture and marine engineering
		14.24	Ocean engineering
		14.28	Textile engineering
		14.99	Engineering, other
		19.09	Textiles and clothing (excluding 19.0902, Fashion Design)
		30.03	Engineering and other fields

PHYSICAL SCIENCES

201	Astronomy		
		40.02	Astronomy
		40.03	Astrophysics
		40.09	Planetary science
202	Chemistry		
		40.05	Chemistry
203	Physics		
		40.08	Physics
204	Physical Sciences, not elsewhere classified		
		40.01	Physical sciences, general
		40.0799	Miscellaneous physical sciences, other
		40.099	Physical sciences, other

EARTH, ATMOSPHERIC, AND OCEAN SCIENCES

301	Atmospheric Sciences		
		40.4	Atmospheric sciences and meteorology
302	Geosciences		
		40.06	Geological and related sciences
		40.0703	Earth and planetary sciences
303	Ocean Sciences		
		26.0607	Marine/aquatic biology
		40.0702	Oceanography
304	Earth, Atmospheric, and Ocean Sciences, N.E.C.		

MATHEMATICS

402	Mathematics and Applied Mathematics		
		06.1302	Operations research (quantitative methods)
		27.01	Mathematics, general
		27.03	Applied mathematics
		27.04	Pure mathematics
		27.99	Mathematics, other
		30.08	Mathematics and computer science
403	Statistics		
		27.02	Actuarial sciences
		27.05	Statistics

COMPUTER SCIENCES

401	Computer Sciences		
		06.12	Management information systems
		11	Computer and information sciences, general
		30.09	Imaging science

AGRICULTURAL SCIENCES (SEE ALSO 102 AND 901)

501	Agricultural Sciences		
		02.01	Agricultural sciences, general
		02.02	Animal sciences
		02.03	Food sciences
		02.04	Plant sciences
		02.05	Soil sciences
		02.99	Agricultural sciences, other
		03.01	Renewable natural resources, general

- 03.03 Fishing and fisheries
- 03.05 Forestry and related sciences
- 03.06 Wildlife management
- 03.99 Renewable natural resources, other
- 31.04 Water resources

BIOLOGICAL SCIENCES

- 601 Anatomy
  - 18.0201 Clinical anatomy
  - 26.0601 Anatomy
- 602 Biochemistry
  - 18.0202 Clinical biochemistry
  - 26.02 Biochemistry and biophysics
- 603 Biology
  - 26.01 Biology, general
  - 26.0604 Embryology
- 604 Biometry and epidemiology
  - 18.2202 Epidemiology
  - 26.0602 Biometrics and biostatistics
- 605 Biophysics
- 606 Botany
  - 26.03 Botany (excluding 26.0302, Bacteriology; see 611)
- 607 Cell Biology
  - 26.04 Cell and molecular biology
  - 26.0606 Histology
- 608 Ecology
  - 26.0603 Ecology
- 609 Entomology and Parasitology
  - 26.0610 Parasitology
  - 26.07102 Entomology
- 610 Genetics
  - 26.0703 Genetics, human and animal
- 611 Microbiology, Immunology, and Virology
  - 18.0203 Clinical microbiology
  - 18.1002 Allergies and endomology
  - 18.1009 Immunology
  - 26.0302 Bacteriology
  - 26.05 Microbiology
- 612 Nutrition
  - 19.05 Food sciences and human nutrition
  - 20.0108 Food and nutrition
  - 26.0609 Nutritional sciences
- 613 Pathology
  - 18.0204 Clinical pathology
  - 18.1018 Pathology
  - 26.0704 Pathology, human and animal
- 614 Pharmacology
  - 18.0206 Clinical toxicology
  - 26.0612 Toxicology
  - 26.0705 Pharmacology, human and animal
  - 42.14 Psychopharmacology
- 615 Physiology
  - 18.0205 Physiology
  - 26.0706 Physiology, human and animal
- 616 Zoology
  - 26.0701 Zoology
  - 26.0799 Zoology, other
- 617 Biosciences, not elsewhere classified
  - 26.0699 Miscellaneous specialized areas, life sciences, other
  - 26.99 Life sciences, other

MEDICAL SCIENCES (see also 103)

- 701 Anesthesiology
  - 18.1003 Anesthesiology
- 702 Cardiology
- 703 Cancer Research/Oncology
- 704 Endocrinology
  - 26.0605 Endocrinology
- 705 Gastroenterology
- 706 Hematology
  - 18.08 Hematology
- 707 Neurology
  - 18.1024 Neurology
  - 26.0608 Neurosciences
- 708 Obstetrics and Gynecology
  - 18.1013 Obstetrics and gynecology
- 709 Ophthalmology
  - 18.1014 Ophthalmology
  - 18.12 Optometry
- 710 Otorhinolaryngology
  - 18.1017 Otorhinolaryngology/otolaryngology
- 711 Pediatrics
  - 18.1019 Pediatrics
  - 20.0102 Child development
- 712 Preventive Medicine and Community Health
  - 18.1007 Family practice
  - 18.1022 Preventive medicine
- 713 Psychiatry
  - 18.1023 Psychiatry
  - 18.1106 Psychiatry/mental health
- 714 Pulmonary Disease
- 715 Radiology
  - 18.1012 Nuclear medicine
  - 18.1025 Radiology
  - 26.0611 Radiobiology
- 716 Surgery
  - 18.1004 Colon and rectal surgery
  - 18.1011 Neurological surgery
  - 18.1016 Orthopedic
  - 18.1021 Plastic surgery
  - 18.1026 Surgery
  - 18.1027 Thoracic surgery
- 717 Clinical Medicine, not elsewhere classified
  - 18.0299 Basic clinical health sciences, other
  - 18.1001 Medicine, general
  - 18.1005 Dermatology
  - 18.1008 Geriatrics
  - 18.1010 Internal medicine
  - 18.1020 Physical medicine and rehabilitation
  - 18.1028 Urology
  - 18.1099 Medicine, other
  - 18.13 Osteopathic medicine
  - 18.15 Podiatry
  - 30.01 Biological and physical sciences
- 718 Dental Sciences
  - 18.04 Dentistry
  - 18.1015 Orthodontic surgery
- 719 Nursing
  - 18.11 Nursing (excluding 18.1106, Psychiatry/mental health; see 713)

- 720 Pharmaceutical Sciences
  - 18.14 Pharmacy
- 721 Veterinary Sciences
  - 18.24 Veterinary medicine
- 722 Health Related, not elsewhere classified
  - 17.0807 Occupational therapy
  - 17.0813 Physical therapy
  - 17.0899 Rehabilitation services, other
  - 17.99 Allied health, other
  - 18.07 Health sciences administration
  - 18.09 Medical laboratory
  - 18.22 Public health
  - 18.99 Health sciences, other
- 723 Speech Pathology and Audiology
  - 18.01 Audiology and speech pathology

PSYCHOLOGY

- 801 Psychology
  - 13.08 School psychology (not including Educational Psychology)
  - 17.0801 Art therapy
  - 42 Psychology (including Educational Psychology)

SOCIAL SCIENCES

- 901 Agricultural Economics
  - 01.0102 Agricultural business and management
  - 01.0103 Agricultural economics
- 902 Anthropology (Cultural and Social)
  - 45.02 Anthropology
  - 45.03 Archeology
- 903 Economics (except Agricultural)
  - 06.05 Business Economics
  - 45.06 Economics
- 904 Geography
  - 45.07 Geography
- 905 History and philosophy of science
- 906 Linguistics
  - 23.06 Linguistics
  - 42.12 Psycholinguistics
- 907 Political Science
  - 44.01 Public affairs, general
  - 44.03 International public service
  - 44.04 Public administration
  - 44.05 Public policy studies
  - 44.99 Public affairs, other
  - 45.09 International affairs
  - 45.10 Political science and government
- 908 Sociology
  - 45.05 Demography
  - 45.11 Sociology
- 909 Sociology and Anthropology
- 910 Social Sciences, not elsewhere classified
  - 04.03 City, community, and regional planning
  - 05 Area and ethnic studies
  - 06.06 Human resources development
  - 06.15 Organizational behavior
  - 31.03 Parks and recreational management
  - 43.01 Criminal justice
  - 44.02 Community services
  - 44.07 Social work
  - 45.01 Social sciences, general
  - 45.04 Criminology
  - 45.12 Urban studies
  - 45.99 Social sciences, other

Appendix D

References

References

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42 U.S.C. 1886.

Appendix E

Validation of Estimates of Deferred Project Costs

Validation of Estimates of Deferred Project Costs

Background

Since estimating the costs of deferred projects is of great policy relevance, this appendix tests an alternative method of estimating unfunded construction and repair/renovation needs. This approach relies on institutional estimates of how much additional space is needed in each field and what proportion of the space in the field requires repair/renovation.

The Survey Questions

In addition to the questions asking about deferred projects reported in Chapter 6, the 1996 survey made two further efforts to measure construction and repair/renovation needs. In Item 2, institutions reported whether the amount of space they currently had for S&E research in each of the fields was adequate for supporting their current research program commitments. If institutions reported an inadequate amount of space, they were asked to indicate the additional space needed (see Item 2 of the survey in Appendix C).

Item 3 requested institutions to evaluate the condition of their current research space in each S&E field by reporting the percentage of space that met certain conditions. For space that required major repair/renovation or replacement, institutions also reported either the space or percent of that space that was funded and scheduled to undergo major renovation or replacement (see Item 3 of the survey in Appendix C).

Data Considerations

In these questions, institutions assessed how much more S&E research space is needed and how much of the existing S&E research space is in poor condition. They also reported how much of the total space is scheduled for construction or renovation. At the same time, however, institutions are bound by their current research commitments. An institution's interest in expanding in a particular S&E field is not included in such estimates, nor are state or national needs to increase knowledge in specified areas reflected in this approach.

Findings

How Much More S&E Research Space Did Colleges and Universities Need?

In 1996, research-performing colleges and universities reported they needed an additional 21.6 million NASF of S&E research space (Table E-1). Of this need for additional space, 10.8 million NASF (50 percent of the needed space) were scheduled for construction in fiscal year 1996 or 1997.

Table E-1. Need for additional science and engineering (S&E) research space (NASF in thousands)

Field	*Existing Research NASF(A)* [1]	*Additional NASF Needed (B)* [2]	*Scheduled New Construction (C)* [3]	*Additional NASF Needed and Not Scheduled for Construction (D)* [4]	*Percent of NASF Needed and Scheduled (E)* [5]
Total	136,481	21,647	10,843	10,804	50%
Biological sciences--outside medical school	18,662	3,247	1,804	1,443	56
Physical sciences	17,872	2,779	1,152	1,627	41
Psychology	3,404	626	82	544	13
Social sciences	3,977	984	176	808	18
Mathematics	1,005	167	72	95	43
Computer sciences	2,075	387	121	266	31
Earth, atmospheric, and ocean sciences	7,246	1,425	746	679	52
Engineering	21,832	3,589	2,122	1,467	59
Agricultural sciences	22,118	2,192	1,051	1,141	48
Medical sciences--outside medical school	7,313	1,535	926	609	60
Medical sciences--medical school	17,815	2,853	2,049	804	72
Biological sciences--medical school	10,797	1,517	465	1,052	31
Other	2,364	345	77	268	22

[1] Data from Table 1-6, total S&E research space.

[2] Data from Table 2-1 (percent additional space needed), converted into NASF.

[3] Data parallels Table 3-6, reported in NASF.

[4] Column (B) minus column (C).

[5] 100% minus Column (D) divided by column (B).

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Institutions reported that the greatest need for additional S&E space was in engineering, for which 3.6 million more NASF were needed. However, 59 percent of this need (2.1 million NASF) was scheduled for construction in either 1996 or 1997. Biological sciences outside of medical schools also accounted for a large amount of needed space (3.2 million NASF), and 56 percent was scheduled for construction in 1996-1997. By contrast, a smaller proportion (31 percent) of the 1.5 million NASF needed in biological sciences in medical schools was scheduled for construction in 1996-1997 (Table E-1).

How Much Renovation or Replacement of Existing S&E Research Space Did Colleges and Universities Need?

Colleges and universities indicated that 25.2 million NASF of their current S&E research space required major renovation or replacement. This represented 18 percent of all S&E research space (25.2 million divided by 136.5 million). Only 22 percent of the space needing such attention (5.5 million NASF) was scheduled for repair/renovation in fiscal year 1996 or 1997 (Table E-2).

Table E-2. Need for renovating or replacing existing science and engineering (S&E) research space
(NASF in thousands)

Field	*Existing Research NASF (A)* [1]	*Existing Research NASF that Require Major Renovation or Replacement (B)* [2]	*Existing NASF that Require Major Renovation or Replacement and are Scheduled for Renovation or Replacement (C)* [3]	*Existing NASF that Require Renovation or Replacement and are not Scheduled for R/R (D)* [4]	*Percent of NASF Needing Renovation or Replacement and Scheduled for R/R (E)* [5]
Total	136,481	25,195	5,497	19,698	22%
Biological sciences--outside medical school	18,662	3,314	782	2,532	24
Physical sciences	17,872	3,356	1,028	2,328	31
Psychology	3,404	419	125	294	30
Social sciences	3,977	522	46	476	9
Mathematics	1,005	99	13	86	13
Computer sciences	2,075	156	32	124	21
Earth, atmospheric, and ocean sciences	7,246	1,384	384	1,000	28
Engineering	21,832	3,899	1,057	2,842	27
Agricultural sciences	22,118	5,201	490	4,711	9
Medical sciences--outside medical school	7,313	1,506	302	1,204	20
Medical sciences--medical school	17,815	3,506	780	2,726	22
Biological sciences--medical school	10,797	1,591	442	1,149	28
Other	2,364	239	16	223	7

[1] Data from Table 1-6, total S&E research space.

[2] Data from Table 2-2 (percent of space requiring major renovation or replacement), converted into NASF.

[3] Data parallels Table 3-7, reported in NASF.

[4] Column (B) minus column (C).

[5] 100% minus Column (D) divided by column (B).

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Institutions indicated that the greatest need for major renovation or replacement to S&E research space was in the agricultural sciences, with 5.2 million NASF requiring such work, representing 21 percent of all S&E research space requiring major renovation or replacement (5.2 million divided by 25.2 million), and 24 percent of all of the S&E research space in agriculture (5.2 million divided by 22.1 million). However, only 9 percent of the agricultural research space needing major renovation or replacement was scheduled for such work in either 1996 or 1997.

What Was the Estimated Cost for Meeting the S&E Research Facilities Needs of Colleges and Universities?

If the additional S&E research space institutions reported needing were constructed, and if the current space that required major renovation or replacement were renovated or replaced, the estimated cost of meeting an unmet need would be roughly $8.0 billion (Table E-3).

Table E-3. Estimated costs of repairing existing science and engineering (S&E) research space and building new S&E research space

	Repair	***Construction***
NASF (in thousands) needing repair/renovation or construction and not scheduled	19,698	10,804
Cost per NASF	$230	$325
Estimated Cost (in millions)	$4,531	$3,511
Total Estimated Cost (in millions)	$8,042	

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Table E-3 shows that institutions reported that approximately 19.7 million NASF needed major renovation or replacement, and that such work was not scheduled. An additional 10.8 million NASF in new construction was reported needed to meet existing program commitments. To derive an estimate of cost for S&E research space needs, an average repair/renovation cost of $230 per NASF was multiplied by the estimate of space needing repair/renovation; and an average new construction cost of $325 per NASF[1] was multiplied by space requiring construction. An estimate of $8.0 billion of combined need for new S&E research space and major renovation to existing space was the result (Table E-3).[2]

This estimate is fairly close to the estimate of deferred project needs reported in Chapter 6 of $9.3 billion. This difference of roughly 15 percent given these two very different methods of calculating need provides some convergent validity for the overall estimate.

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[1] The average construction cost per NASF was derived by dividing the total costs of construction reported by institutions by the number of NASF that were being constructed. The average repair/renovation cost was derived similarly (see question 3). Although several factors (e.g., type of project, geographic location) can result in varying construction and repair costs, the overall average is the safest figure to use when information is not available concerning the specific nature of the projects.

[2] Since some proportion of the space requiring major renovation will need to be replaced at a higher cost than the average for repair/renovation, total costs actually may be higher than the $8.0 billion cited. The 1994 Facilities survey found that about 25 percent of all major renovation projects require replacement of the space. Assuming a quarter of the renovations will incur costs similar to new construction, the total need estimate would rise to $8.5 billion.

Appendix F

Detailed Statistical Tables

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Table F1-5. Number of public and private research-performing institutions with space assigned to science and engineering (S&E) fields, and number with assigned research space in S&E fields: 1988, 1990, 1992, 1994 and 1996

Field	*Institutions with S&E Space*										*Institutions with S&E research space*									
	Public					*Private*					*Public*					*Private*				
	1988	**1990**	**1992**	**1994**	**1996**	**1988**	**1990**	**1992**	**1994**	**1996**	**1988**	**1990**	**1992**	**1994**	**1996**	**1988**	**1990**	**1992**	**1994**	**1996**
Total	320	319	319	326	324	205	206	206	239	236	316	319	311	323	324	197	198	190	228	236
Biological sciences-- outside medical school	291	291	296	313	312	184	187	189	196	205	287	277	266	298	303	168	174	168	191	201
Physical sciences	286	285	283	310	308	188	186	185	202	202	280	280	269	301	294	165	170	164	184	195
Psychology	286	285	269	290	295	186	185	166	179	184	263	261	245	259	263	140	141	132	153	166
Social sciences	272	278	262	283	277	189	169	159	167	179	246	244	214	232	229	114	103	103	138	149
Mathematics	277	275	275	295	302	178	182	184	191	191	218	197	184	197	206	101	98	101	124	137
Computer sciences	253	247	264	278	261	173	158	162	177	180	213	164	192	199	205	120	116	92	134	135
Earth, atmospheric and ocean sciences	224	221	210	229	233	99	105	119	106	106	213	195	193	201	211	87	88	105	91	95
Engineering	219	225	220	221	232	76	73	84	92	90	207	222	204	198	202	76	73	77	92	86
Agricultural sciences	99	96	88	116	112	6	7	10	4	6	90	87	84	110	106	6	7	10	4	6
Medical sciences-- outside medical school	196	202	195	211	225	38	48	62	62	59	170	152	156	179	193	36	37	51	56	47
Medical sciences-- medical school	86	89	96	65	63	51	55	54	60	54	82	86	92	63	63	51	55	54	60	54
Biological sciences-- medical school	68	70	79	66	61	26	35	49	64	60	68	70	77	66	56	26	35	49	64	60
Other, not elsewhere classified	92	63	61	51	67	19	13	21	35	29	73	57	53	45	60	19	13	18	21	22

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F1-6. Total net assignable square feet (NASF) of space in science and engineering fields by field and institution type: 1988, 1990, 1992, 1994 and 1996

[NASF in thousands]

						Institution type															
						Doctorate-granting														
	Total					Top 100 in research expenditures					Other					*Nondoctorate-granting*				
Field	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996
Total	270,621	276,041	285,383	282,176	284,905	165,655	163,911	171,895	170,627	173,370	75,070	80,024	84,340	82,110	82,500	29,895	32,107	29,148	29,440	29,035
Biological sciences–outside medical school	32,445	34,385	33,108	34,717	35,889	18,769	19,046	18,703	18,866	19,385	7,850	9,318	8,842	10,349	11,202	5,827	6,022	5,562	5,501	5,302
Physical sciences	35,634	37,542	36,722	37,648	37,822	18,807	19,264	19,075	18,530	19,139	9,677	9,854	10,613	12,059	11,938	7,150	8,425	7,085	7,057	6,746
Psychology	9,011	9,122	8,329	8,728	8,923	4,182	4,025	3,894	3,866	4,054	2,528	2,759	2,726	3,009	3,016	2,302	2,339	1,708	1,852	1,853
Social sciences	16,433	15,158	14,926	17,089	17,270	9,766	8,798	8,659	9,647	9,974	3,264	3,424	3,655	4,790	4,721	3,403	2,936	2,612	2,651	2,576
Mathematics	4,786	5,190	5,198	5,956	5,746	2,179	2,279	2,207	2,398	2,410	1,490	1,662	1,753	1,921	1,864	1,116	1,249	1,238	1,637	1,473
Computer sciences	4,938	4,625	5,707	6,206	6,290	2,245	2,430	2,818	2,795	2,839	1,594	1,318	1,673	1,826	1,880	1,099	877	1,216	1,584	1,571
Earth, atmospheric and ocean sciences	12,268	12,019	12,411	12,174	12,463	7,816	7,598	6,799	7,751	7,859	3,239	3,222	4,371	3,181	3,333	1,214	1,199	1,241	1,242	1,272
Engineering	40,063	42,291	43,150	44,752	46,140	24,422	24,810	26,089	26,361	27,543	11,353	12,177	12,505	14,481	14,731	4,288	5,103	4,556	3,909	3,866
Agricultural sciences	29,994	34,003	33,161	33,971	35,056	22,276	24,706	25,699	26,402	27,282	5,948	7,194	5,500	5,796	5,759	1,771	2,103	1,962	1,773	2,015
Medical sciences–outside medical school	21,387	21,955	24,572	22,445	23,449	14,699	15,090	15,576	13,731	14,735	5,441	5,651	7,380	6,890	6,740	1,247	1,214	1,615	1,823	1,974
Medical sciences–medical school	44,843	41,213	45,532	37,578	35,899	28,502	23,934	27,668	25,881	24,413	16,341	17,279	17,864	11,697	11,486	0	0	0	0	0
Biological sciences–medical school	12,739	14,936	18,670	16,954	16,016	7,999	9,231	11,575	11,151	11,105	4,741	5,705	7,095	5,803	4,911	0	0	0	0	0
Other, not elsewhere classified	6,078	3,602	3,846	3,958	3,941	3,993	2,701	3,132	3,247	2,633	1,604	461	362	303	919	480	440	352	407	389

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F1-3. Number of research-performing institutions with space assigned to science and engineering fields, by field and institution type: 1988, 1990, 1992, 1994 and 1996

[NASF in millions]

Field	Total					Institution type														
						Doctorate-granting										*Nondoctorate-granting*				
						Top 100 in research expenditures					Other									
	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996
Total	525	525	525	565	560	100	100	100	100	100	193	193	194	219	218	232	232	231	246	242
Biological sciences--outside medical school	475	479	485	509	517	96	95	94	93	94	151	156	161	184	186	229	228	231	232	237
Physical sciences	473	471	468	512	510	93	93	89	91	90	150	147	147	181	181	230	231	231	241	239
Psychology	472	470	435	469	479	91	91	86	88	88	155	155	155	176	176	227	225	194	205	215
Social sciences	461	447	421	450	457	94	95	91	93	91	153	155	152	165	164	214	198	177	191	201
Mathematics	455	457	458	486	493	93	93	88	90	88	148	145	153	171	178	215	219	217	225	227
Computer sciences	426	404	426	455	441	86	86	83	82	82	133	131	144	167	158	207	187	199	208	200
Earth, atmospheric and ocean sciences	323	326	329	336	339	84	85	83	86	88	120	112	122	129	131	118	129	124	121	120
Engineering	295	299	304	314	322	86	86	86	88	87	128	129	130	129	133	81	84	88	98	102
Agricultural sciences	104	103	98	120	118	42	41	40	41	42	30	27	25	29	24	32	35	33	50	52
Medical sciences--outside medical school	235	250	257	272	285	68	68	72	67	78	79	91	114	119	116	88	91	70	86	91
Medical sciences--medical school	138	144	150	125	118	64	64	67	66	64	74	80	83	59	54	0	0	0	0	0
Biological sciences--medical school	94	105	128	131	121	50	55	60	60	58	44	50	68	71	63	0	0	0	0	0
Other, not elsewhere classified	111	75	82	86	95	47	40	38	41	38	40	23	30	25	34	24	12	14	19	23

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F1-4. Number of institutions with research space in science and engineering fields by field and institution type: 1988, 1990, 1992, 1994 and 1996

Field	*Total*					*Institution type*														
						Doctorate-granting										*Nondoctorate-granting*				
						Top 100 in research expenditures					Other									
	1988	**1990**	**1992**	**1994**	**1996**	**1988**	**1990**	**1992**	**1994**	**1996**	**1988**	**1990**	**1992**	**1994**	**1996**	**1988**	**1990**	**1992**	**1994**	**1996**
Total	513	517	501	551	560	100	100	100	100	100	188	187	188	219	218	225	229	213	232	242
Biological sciences-- outside medical school	456	451	434	489	504	95	94	94	93	94	144	149	152	184	186	217	208	188	213	223
Physical sciences	446	450	432	485	490	92	92	89	91	90	142	141	141	181	181	212	217	202	214	219
Psychology	403	402	377	412	430	87	86	84	85	86	131	132	142	165	171	185	184	150	162	173
Social sciences	360	347	318	370	378	89	91	87	89	89	127	117	114	141	137	144	140	116	140	152
Mathematics	318	296	285	321	343	85	88	85	82	83	105	85	91	125	140	129	124	109	114	120
Computer sciences	332	281	284	333	340	78	79	80	74	77	95	89	90	130	132	159	113	114	128	131
Earth, atmospheric and ocean sciences	299	294	298	291	306	80	82	81	81	85	120	112	121	118	125	98	89	96	92	96
Engineering	283	296	280	290	288	85	86	86	87	86	128	129	126	122	123	70	81	68	82	79
Agricultural sciences	96	94	95	114	112	42	41	40	41	42	30	27	25	29	24	24	26	30	44	45
Medical sciences-- outside medical school	205	189	208	235	239	67	67	67	67	77	70	64	96	101	100	69	57	44	67	62
Medical sciences-- medical school	134	141	146	122	118	63	64	66	66	64	71	77	80	56	54	0	0	0	0	0
Biological sciences-- medical school	94	105	125	131	116	50	55	60	60	58	44	50	66	71	58	0	0	0	0	0
Other, not elsewhere classified	92	69	71	66	81	45	40	37	40	37	35	18	26	15	30	12	11	7	12	15

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F1-1. Number of research-performing institutions, total net assignable square feet (NASF) of space in all academic fields, NASF in science and engineering (S&E) fields, and research NASF in S&E fields by institution type and control: 1996

[NASF in millions]

Institution type and control	*Number of research-performing institutions*	*Total NASF in all fields*[1]	*Total NASF in S&E fields*	*Research NASF in S&E fields*
Total	560	511	285	136
Doctorate-granting	318	434	256	131
Top 100 in research expenditures	100	255	173	98
Other	218	179	82	32
Nondoctorate-granting	242	77	29	6
Public	324	375	208	99
Doctorate-granting	188	324	187	96
Nondoctorate-granting	136	51	20	4
Private	236	137	77	38
Doctorate-granting	130	110	69	35
Nondoctorate-granting	106	26	9	2

[1] Projected from responses of 88 percent of institutions.

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F1-2. Number of research-performing institutions, total net assignable square feet (NASF) of space in science and engineering (S&E) fields, and research NASF in S&E fields by institution type and control: 1988, 1990, 1992, 1994 and 1996

[NASF in millions]

Institution type and control	*Number of institutions*					*Total NASF in S&E fields*					*Research NASF in S&E fields*				
	1988	*1990*	*1992*	*1994*	*1996*	*1988*	*1990*	*1992*	*1994*	*1996*	*1988*	*1990*	*1992*	*1994*	*1996*
Total	525	525	525	565	560	270.6	276.0	285.4	282.2	284.9	112.1	116.3	122.0	127.2	136.5
Doctorate-granting	293	293	294	319	318	240.7	243.9	256.3	252.7	255.9	107.4	111.2	117.4	121.8	130.7
Top 100 in research expenditures	100	100	100	100	100	165.7	163.9	171.9	170.6	173.4	80.6	81.7	87.5	90.9	98.3
Other	193	193	194	219	218	75.1	80.0	84.3	82.1	82.5	26.8	29.5	29.9	30.9	32.4
Nondoctorate-granting	232	232	231	246	242	29.9	32.1	29.1	29.4	29.0	4.6	5.2	4.6	5.4	5.8
Public	320	319	319	326	324	204.3	211.7	218.7	203.1	207.5	82.4	86.9	90.8	91.7	99.0
Doctorate-granting	191	190	192	188	188	183.5	188.9	198.6	182.7	187.3	79.3	83.6	88.0	88.2	95.5
Nondoctorate-granting	129	129	127	138	136	20.8	22.8	20.1	20.5	20.2	3.1	3.3	2.8	3.5	3.5
Private	205	206	206	239	236	66.3	64.4	66.7	79.0	77.4	29.7	29.4	31.2	35.6	37.5
Doctorate-granting	102	103	102	131	130	57.2	55.1	57.6	70.9	68.6	28.2	27.6	29.4	33.7	35.2
Nondoctorate-granting	103	103	104	108	106	9.1	9.3	9.1	8.9	8.8	1.5	1.8	1.8	1.9	2.3

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F1-7. Total net assignable square feet (NASF) of space in science and engineering (S&E) fields,
[NASF in thousands]

Field	Total					Institution type														
						Doctorate-granting										Nondoctorate-granting				
						Top 100 in research expenditures					Other									
	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996
Total	112,062	116,327	122,015	127,369	136,481	80,627	81,659	87,508	90,974	98,273	26,815	29,508	29,865	30,956	32,411	4,620	5,161	4,642	5,438	5,797
Biological sciences--outside medical school	16,072	17,569	17,072	16,982	18,662	11,403	11,715	11,316	11,487	12,409	3,668	4,727	4,589	4,106	4,803	1,001	1,128	1,167	1,389	1,450
Physical sciences	16,024	16,121	16,353	17,001	17,872	10,443	10,429	10,487	10,380	11,154	4,236	4,232	4,767	5,347	5,358	1,344	1,459	1,099	1,275	1,361
Psychology	3,085	2,978	2,984	3,178	3,404	1,771	1,581	1,665	1,717	1,829	896	984	981	1,047	1,133	418	413	337	413	442
Social sciences	3,337	3,338	3,253	3,403	3,977	2,380	2,359	2,339	2,204	2,766	635	671	654	872	877	322	309	260	326	334
Mathematics	722	790	829	937	1,005	397	415	437	491	555	260	300	300	312	306	65	75	92	132	145
Computer sciences	1,437	1,445	1,606	1,779	2,075	835	1,017	1,114	1,179	1,396	431	315	332	361	430	170	113	160	238	249
Earth, atmospheric and ocean sciences	6,313	6,056	6,728	7,053	7,246	4,645	4,534	4,145	5,324	5,411	1,458	1,314	2,251	1,436	1,530	210	208	332	292	305
Engineering	15,900	17,057	18,095	20,730	21,832	11,444	12,130	13,577	14,538	15,649	3,928	4,214	3,996	5,557	5,599	529	713	523	636	584
Agricultural sciences	17,622	20,821	19,910	20,120	22,118	14,433	16,032	16,714	16,952	18,496	2,821	4,247	2,737	2,692	3,031	368	542	459	475	590
Medical sciences--outside medical school	5,320	4,959	6,234	6,070	7,402	4,208	4,133	4,806	4,397	5,435	1,004	713	1,328	1,497	1,712	109	113	100	175	255
Medical sciences--medical school	14,042	14,762	16,139	16,799	17,727	10,365	9,957	11,569	12,564	13,485	3,677	4,805	4,571	4,234	4,242	0	0	0	0	0
Biological sciences--medical school	7,838	8,584	10,649	10,876	10,797	5,401	5,831	7,489	7,587	8,093	2,437	2,754	3,160	3,288	2,704	0	0	0	0	0
Other, not elsewhere classified	4,350	1,846	2,162	2,442	2,363	2,903	1,526	1,851	2,152	1,596	1,364	232	198	203	685	83	87	113	86	82

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F1-8. Total net assignable square feet (NASF) of space in science and engineering (S&E) fields, and research NASF in S&E fields, by field and institution control: 1988, 1990, 1992, 1994 and 1996
[NASF in thousands]

Field	*Total NASF in S&E fields*										*Research NASF in S&E fields*									
	Public					*Private*					*Public*					*Private*				
	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996
Total	204,302	211,651	218,687	203,107	207,483	66,318	64,390	66,696	79,069	77,422	82,384	86,881	90,815	91,723	98,958	26,678	29,447	31,200	35,645	37,522
Biological sciences--outside medical school	24,164	26,449	25,754	26,186	27,145	8,281	7,937	7,354	8,530	8,744	11,473	13,240	13,327	12,646	13,852	4,599	4,329	3,745	4,337	4,811
Physical sciences	24,505	26,595	25,912	25,048	25,533	11,129	10,947	10,860	12,599	12,289	10,719	10,944	11,299	11,342	12,175	5,305	5,177	5,054	5,659	5,697
Psychology	6,254	6,415	5,960	6,224	6,486	2,758	2,706	2,369	2,503	2,437	2,216	2,102	2,148	2,266	2,434	869	876	836	911	970
Social sciences	12,284	11,071	11,305	12,006	12,708	4,149	4,087	3,621	5,082	4,562	2,794	2,684	2,601	2,806	3,284	543	655	652	597	693
Mathematics	3,520	3,874	3,811	4,309	4,097	1,266	1,316	1,387	1,646	1,649	505	527	554	635	629	217	264	276	301	376
Computer sciences	3,530	3,041	3,947	3,977	4,181	1,408	1,584	1,759	2,229	2,110	875	735	973	975	1,135	562	710	633	804	940
Earth, atmospheric and ocean sciences	9,624	9,393	9,981	9,307	9,555	2,644	2,626	2,430	2,866	2,908	5,045	4,833	5,718	5,692	5,774	1,267	1,223	1,009	1,361	1,472
Engineering	29,780	32,224	33,252	33,492	35,375	10,284	10,066	9,898	11,260	10,765	11,593	12,562	13,383	15,418	16,373	4,306	4,495	4,712	5,311	5,459
Agricultural sciences	29,238	32,510	31,409	30,707	31,852	756	1,493	1,753	3,264	3,204	17,233	19,434	18,304	18,788	20,937	389	1,387	1,607	1,331	1,181
Medical sciences--outside medical school	16,920	18,755	19,675	17,563	18,683	4,468	3,200	4,897	4,882	4,766	3,948	4,137	4,674	4,608	5,802	1,373	822	1,560	1,461	1,600
Medical sciences--medical school	31,891	28,935	34,335	23,306	21,239	12,953	12,278	11,197	14,272	14,660	8,368	9,022	10,434	9,738	9,766	5,675	5,739	5,705	7,061	7,960
Biological sciences--medical school	8,433	9,388	10,306	8,352	7,756	4,307	5,547	8,364	8,601	8,259	4,854	5,067	5,768	5,189	5,069	2,984	3,517	4,881	5,687	5,729
Other, not elsewhere classified	4,162	3,000	3,038	2,627	2,873	1,917	602	808	1,332	1,068	2,761	1,593	1,632	1,620	1,727	1,589	253	530	824	636

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *1996 Scientific and Engineering Research Facilities at Colleges and Universities*.

Table F2-4. Adequacy of the amount of science and engineering research space by field: 1988, 1990, 1992, 1994 and 1996

[Percentage of institutions' S&E research space]

Institution type and control	Suitable for use in most scientifically sophisticated research					Effective for most uses, but not most scientifically sophisticated research					Requires limited/repair/renovation to be used effectively					Requires major repair/renovation to be used effectively[1]					Requires replacement[2]		
	1988	1990	1992	1994	1996 [3]	1988	1990	1992	1994	1996 [3]	1988	1990	1992	1994	1996 [3]	1988	1990	1992	1994	1996 [3]	1992	1994	1996 [3]
Total	23.9%	25.9%	26.8%	26.4%	37.2%	36.8%	35.3%	34.7%	32.8%		23.5%	23.3%	22.6%	23.1%	43.9%	15.8%	15.5%	12.8%	12.9%		3.1%	4.1%	18.5%
Doctorate-granting	24.3	26.2	27.2	26.9	37.8	36.2	34.8	34.3	32.4		23.5	23.3	22.4	22.9	43.4	16.2	15.7	12.9	12.9		3.2	4.2	18.5
Top 100 in research expenditures	23.9	27.2	26.7	26.7	37.9	35.0	33.4	31.8	31.7		24.0	22.9	23.4	22.9	42.7	17.1	16.5	14.2	13.1		3.9	4.8	18.9
Other	25.6	23.5	28.8	27.1	37.5	39.8	38.6	41.8	34.8		21.8	24.2	19.3	23.1	45.4	12.8	13.6	9.2	12.2		1.0	2.5	17.1
Nondoctorate-granting	15.6	18.9	16.8	15.8	23.8	49.5	47.2	43.0	41.3		23.8	22.8	29.2	26.7	56.8	11.1	11.1	9.8	13.9		1.2	2.2	18.4
Public	23.1	24.5	25.5	25.2	35.2	36.2	35.7	34.8	33.2		24.4	23.9	23.1	24.1	45.8	16.4	15.9	13.1	13.0		3.5	4.7	18.5
Doctorate-granting	23.4	24.6	25.7	26.0	35.7	35.7	35.4	34.6	32.9		24.4	24.0	22.9	23.8	45.3	16.6	16.0	13.2	12.5		3.6	4.7	18.5
Nondoctorate-granting	17.5	21.1	19.1	16.0	21.7	48.0	44.3	41.8	38.3		24.0	22.7	26.8	27.2	58.9	10.4	11.8	11.2	16.0		1.1	2.3	19.4
Private	26.2	30.1	30.8	27.7	42.5	38.4	34.1	34.3	31.9		21.0	21.2	21.4	21.6	39.0	14.4	14.5	11.7	12.7		1.8	2.7	18.4
Doctorate-granting	27.0	31.1	31.8	29.4	43.5	37.6	32.9	33.6	32.0		20.9	21.1	20.7	20.5	38.0	14.5	14.8	12.0	11.7		1.9	2.6	18.5
Nondoctorate-granting	11.5	15.1	13.3	15.3	26.9	52.8	52.4	44.9	46.6		23.3	22.9	32.8	25.7	53.7	12.4	9.7	7.5	10.1		1.4	1.9	17.1

[1] The data for 1988 and 1990 in this category include space requiring replacement.

[2] This category was first used in the 1992 survey.

[3] 1996 survey response categories changed to: suitable for the most scientifically competitive research; effective for most levels of research, but may need limited repair/renovation; and requires major renovation or replacement to be used effectively.

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions, all previous years' data (1988, 1990, 1992) represent 525 institutions.
In 1994, data from 1988, 1990, and 1992 were adjusted to match the analytic procedure used to calculate 1994 figures.

Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F2-5. Adequacy of the amount of science and engineering research space by field: 1988, 1990, 1992, 1994 and 1996

Field	*Suitable for use in most scientifically sophisticated research*					*Effective for most uses, but not most scientifically sophisticated research*					*Requires limited/repair/renovation to be used effectively*					*Requires major repair/renovation to be used effectively* [1]					*Requires replacement* [2]		
	1988	*1990*	*1992*	*1994*	*1996* [3]	*1988*	*1990*	*1992*	*1994*	*1996* [3]	*1988*	*1990*	*1992*	*1994*	*1996* [3]	*1988*	*1990*	*1992*	*1994*	*1996* [3]	*1992*	*1994*	*1996* [3]
Biological sciences-- outside medical school	23.2%	27.5%	25.5%	22.6%	37.9%	36.2%	34.3%	32.6%	31.0%		25.0%	24.2%	26.7%	27.1%	43.8%	15.5%	14.0%	12.5%	14.2%		2.8%	5.0%	17.8%
Physical sciences	25.7	26.3	29.9	24.8	32.2	34.5	33.5	32.5	33.8		22.3	23.7	23.0	23.8	48.3	17.5	16.5	12.5	15.3		2.1	2.3	18.8
Psychology	23.2	20.5	22.2	22.8	38.2	43.7	46.6	46.9	37.9		20.8	21.4	20.9	26.1	48.7	12.3	11.6	9.0	11.1		1.0	2.0	12.3
Social sciences	14.8	17.2	17.1	14.4	31.8	47.7	45.0	42.8	46.2		26.7	28.1	26.7	28.2	54.2	10.8	9.8	12.2	9.0		1.2	1.9	13.1
Mathematics	29.5	25.9	30.6	22.6	42.9	45.3	44.6	47.1	47.0		19.4	21.9	17.5	24.9	46.8	5.8	7.6	3.0	4.1		1.8	1.3	9.9
Computer sciences	32.6	38.3	43.9	35.2	55.0	35.0	35.5	35.4	40.9		16.2	18.0	13.7	17.9	37.1	16.2	8.1	6.0	4.7		1.0	1.2	7.5
Earth, atmospheric and ocean sciences	18.7	18.7	22.5	22.1	32.4	40.6	40.4	41.9	35.9		26.0	26.1	23.7	22.9	48.1	14.7	14.8	9.5	13.0		2.4	6.0	19.1
Engineering	26.1	27.9	28.4	31.4	38.2	37.6	35.6	36.1	32.3		22.4	22.0	22.2	21.3	43.3	13.9	14.5	10.8	12.1		2.4	2.8	17.9
Agricultural sciences	21.2	20.3	16.8	18.2	30.2	32.5	33.6	34.3	32.0		26.2	24.1	22.7	27.4	46.2	20.0	22.0	18.5	13.6		7.7	8.8	23.5
Medical sciences-- outside medical school	18.1	24.0	24.4	25.7	35.2	40.1	35.1	34.4	34.4		27.2	23.8	24.0	23.3	43.6	14.6	17.0	13.8	11.8		3.4	4.7	20.6
Medical sciences-- medical school	25.2	28.4	29.7	33.7	44.3	35.1	34.4	33.3	29.1		23.1	23.7	22.3	20.5	36.0	16.6	13.4	12.6	13.5		2.0	3.3	19.7
Biological sciences-- medical school	36.2	34.3	38.6	36.9	45.1	34.0	33.5	30.2	32.2		16.5	18.9	17.4	15.8	40.1	13.4	13.2	12.5	13.3		1.4	1.8	14.7

[1] The data for 1988 and 1990 in this category include space requiring replacement.

[2] This category was first used in the 1992 survey.

[3] 1996 survey response categories changed to: suitable for the most scientifically competitive research; effective for most levels of research, but may need limited repair/renovation; and requires major renovation or replacement to be used effectively.

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.
In 1994, data from 1988, 1990, and 1992 were adjusted to match the analytic procedure used to calculate 1994 figures.

Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F2-2. Adequacy of the amount of science and engineering research space by field: 1988, 1990, 1992, 1994 and 1996 by field and institution type: 1988, 1990, 1992, 1994 and 1996

Field	*Institution type*														
	Doctorate-granting										*Nondoctorate-granting*				
	Top 100 in research expenditures					Other									
	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996
Biological sciences--outside medical school	52%	50%	44%	51%	61%	46%	43%	35%	32%	49%	43%	40%	37%	38%	52%
Physical sciences	63	57	48	51	56	43	45	38	46	55	35	31	31	32	51
Psychology	32	38	34	31	43	26	32	35	25	42	36	29	32	37	42
Social sciences	36	39	37	38	55	29	34	27	26	42	44	36	26	27	44
Mathematics	45	35	28	32	30	29	35	24	19	26	10	37	28	35	32
Computer sciences	54	55	35	43	39	46	39	26	30	36	43	42	28	39	47
Earth, atmospheric and ocean sciences	47	50	38	41	46	44	33	23	34	39	33	42	40	27	47
Engineering	61	59	52	55	57	46	41	37	35	57	49	49	53	35	48
Agricultural sciences	42	45	42	37	30	39	51	29	29	50	28	32	31	24	35
Medical sciences--outside medical school	48	56	32	43	44	43	35	41	41	65	26	49	32	30	47
Medical sciences--medical school	62	52	53	33	40	57	33	35	35	69	-	-	-	-	-
Biological sciences--medical school	51	64	46	49	31	35	43	26	24	38	-	-	-	-	-

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

In 1994, data from 1988, 1990, and 1992 were adjusted to match the analytic procedure used to calculate 1994 figures.

In 1996, survey question categories were worded slightly differently (see Table F2-1 notes).

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F2-3. Adequacy of the amount of science and engineering research space by field: 1988, 1990, 1992, 1994 and 1996 by field and institution control: 1988, 1990, 1992, 1994 and 1996

Field	*Public*					*Private*				
	1988	*1990*	*1992*	*1994*	*1996*	*1988*	*1990*	*1992*	*1994*	*1996*
Biological sciences-- outside medical school	48%	54%	43%	46%	63%	42%	25%	28%	30%	39%
Physical sciences	44	47	43	43	60	40	29	26	36	51
Psychology	32	31	36	33	47	31	34	28	29	40
Social sciences	37	37	32	32	48	38	34	23	25	47
Mathematics	27	43	31	32	40	21	21	17	22	16
Computer sciences	45	49	31	38	49	50	40	24	33	35
Earth, atmospheric and ocean sciences	50	46	39	34	46	23	29	17	31	46
Engineering	51	51	52	47	62	50	10	28	25	46
Agricultural sciences	39	45	38	29	53	20	14	12	46	33
Medical sciences-- outside medical school	41	50	39	38	59	36	31	27	39	51
Medical sciences-- medical school	55	61	42	48	67	33	56	42	40	65
Biological sciences-- medical school	56	61	37	39	50	31	40	34	32	41

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

In 1994, data from 1988, 1990, and 1992 were adjusted to match the analytic procedure used to calculate 1994 figures.

In 1996, survey question categories were worded slightly differently (see Table F2-1 notes).

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F1-9. Total net assignable square feet (NASF) of space in science and engineering (S&E) fields, by institution type and control: 1988, 1990, 1992, 1994 and 1996

Institution type and control	*NASF in thousands*					*Percentage of total research NASF*				
	1988	**1990**	**1992**	**1994**	**1996**	**1988**	**1990**	**1992**	**1994**	**1996**
Total	3,771	3,551	4,755	4,366	5,461	3.4%	3.1%	3.9%	3.0%	4.0%
Doctorate-granting	3,760	3,536	4,717	4,317	5,444	3.5	3.2	4.0	3.5	4.2
Top 100 in research expenditures	2,847	2,601	3,532	3,696	4,544	3.5	3.2	4.0	4.0	4.6
Other	913	935	1,185	621	900	3.4	3.2	4.0	2.0	2.8
Nondoctorate-granting	11	15	38	48	17	0.2	0.3	0.8	0.9	0.3
Public	2,315	2,145	2,869	3,169	1,625	2.8	2.5	3.2	3.0	4.3
Private	1,456	1,406	1,886	1,196	3,836	4.9	4.8	6.0	3.0	3.9

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.
Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F2-1. Adequacy of the amount of science and engineering research space by field: 1988, 1990, 1992, 1994 and 1996

Field	Number of institutions[1]					Adequate					Generally adequate					Inadequate[2]				
	1988	1990	1992	1994	1996	1988	1990	1992	1994	1996[3]	1988	1990	1992	1994	1996[3]	1988	1990	1992	1994	1996[3]
						[Percentage of institutions' assessments]														
Biological sciences--outside medical school	444	451	434	490	504	8.3%	8.7%	10.8%	6.2%	45.9%	45.8%	48.2%	51.8%	53.7%		45.9%	43.1%	37.4%	40.1%	53.3%
Physical sciences	445	450	433	489	490	4.7	8.7	10.6	6.4	44.9	52.4	50.8	52.3	53.1		42.9	40.5	37.0	40.5	54.5
Psychology	403	398	388	425	430	16.8	13.2	17.2	14.8	55.4	51.4	54.3	50.0	53.9		31.8	32.4	32.9	31.2	43.8
Social sciences	360	345	328	378	378	12.9	12.7	8.2	7.2	51.2	50.2	51.0	64.4	63.4		36.9	36.2	27.4	29.3	47.6
Mathematics	318	296	300	348	343	21.0	17.6	16.1	16.0	68.4	53.6	47.2	58.6	55.5		25.4	35.2	25.3	28.3	30.3
Computer sciences	331	280	297	347	340	15.1	13.5	12.9	15.5	54.6	38.2	41.5	56.7	48.3		46.9	45.0	30.3	36.0	43.7
Earth, atmospheric and ocean sciences	297	284	314	310	306	11.0	11.1	10.5	7.2	53.7	49.4	48.4	59.4	59.6		39.5	40.5	30.1	33.2	46.0
Engineering	283	296	290	297	288	8.7	10.6	5.8	6.7	42.8	40.1	40.8	49.1	53.3		51.1	48.6	45.1	40.5	57.2
Agricultural sciences	96	94	96	123	112	11.0	17.0	17.5	10.5	48.1	51.2	39.9	48.2	59.7		37.7	43.1	34.3	29.6	51.9
Medical sciences--outside medical school	191	189	210	243	239	14.3	13.0	14.2	11.7	42.6	46.0	40.3	50.1	50.3		39.7	46.7	35.7	38.2	57.4
Medical sciences--medical school	134	141	146	126	118	0.8	7.0	4.2	10.8	34.1	52.6	33.8	54.1	44.8		46.6	59.2	41.8	44.0	65.9
Biological sciences--medical school	91	105	125	132	116	3.7	10.4	3.6	10.6	55.9	47.3	35.5	60.5	53.5		49.0	54.1	35.9	35.5	45.5
Other, not elsewhere classified	90	69	71	63	81	10.4	16.9	14.0	15.0	51.8	51.3	39.2	44.9	50.0		38.4	44.0	41.1	36.5	40.7

[1] Excludes institutions that have have no research space in the field and report "not applicable or not needed."

[2] Includes the category "nonexistent but needed."

[3] 1996 survey question included only two categories: adequate and inadequate. In previous years' surveys, there were three categories: adequate, generally adequate, and inadequate.

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.
Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F3-1. Number of research-performing institutions starting any projects to construct science and engineering research space by institution type and control: 1986-1995

Institution type and control	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 [Scheduled]*
Total	192	227	191	184	164	160
Doctorate-granting	135	154	165	144	132	128
Top 100 in research expenditures	72	71	81	81	75	64
Other	64	83	84	63	57	64
Nondoctorate-granting	57	73	27	39	32	32
Public	140	158	136	133	115	115
Doctorate-granting	103	106	116	103	97	97
Nondoctorate-granting	37	52	20	30	19	19
Private	52	68	55	51	49	45
Doctorate-granting	32	48	49	42	35	32
Nondoctorate-granting	19	21	7	10	14	14

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F3-2. For projects to construct science and engineering research space, estimated net assignable square feet (NASF) of research space to be created and estimated total cost of the construction of this research space, by institution type and control: 1986-1995
[NASF in thousands; current dollars in millions]

Institution type and control	*1986-1987*		*1988-1989*		*1990-1991*		*1992-1993*		*1994-1995*		*1996-1997 [Scheduled]*	
	NASF	*Cost*	*NASF*	*Cost*	*NASF*	*Cost*	*NASF*	*Cost*	*NASF*	*Cost*	*NASF*	*Cost*
Total	9,922	$2,051	10,647	$2,464	11,433	$2,976	10,992	$2,811	9,521	$2,768	10,843	$3,072
Doctorate-granting	8,908	1,888	9,840	2,315	11,022	2,847	10,474	2,720	8,818	2,437	10,112	2,807
Top 100 in research expenditures	7,261	1,599	6,073	1,558	6,972	2,022	6,787	2,029	6,426	2,007	6,442	2,104
Other	1,647	288	3,767	757	4,050	826	3,687	691	2,391	430	3,670	704
Nondoctorate-granting	1,014	163	807	150	411	128	518	92	703	331	731	264
Public	7,344	1,355	8,115	1,727	8,268	2,020	8,189	2,016	6,838	1,872	8,278	2,234
Doctorate-granting	6,516	1,220	7,460	1,626	7,942	1,906	7,695	1,929	6,252	1,578	7,834	2,039
Nondoctorate-granting	828	134	656	101	325	114	494	86	586	294	444	195
Private	2,578	696	2,532	738	3,165	956	2,802	796	2,683	895	2,566	837
Doctorate-granting	2,392	667	2,381	689	3,079	941	2,778	789	2,566	859	2,279	768
Nondoctorate-granting	186	29	152	48	86	15	24	6	117	36	287	69

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 3 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F4-3. Number of research-performing institutions performing major repair/renovation of science and engineering research facilities, by field: 1986-1995

Field	1986-1987	1988-1989	1990 or 1991	1992-1993	1994-1995	1996-1997 [Scheduled]
Total	288	248	244	252	252	243
Biological sciences-- outside medical school	112	121	96	104	113	97
Physical sciences	98	104	98	104	118	107
Psychology	35	20	44 [1]	18	22	30
Social sciences	29	17		20	33	29
Mathematics	25	26	12	6	14	4
Computer sciences	49	16	29	20	25	17
Earth, atmospheric and ocean sciences	40	26	37	38	33	41
Engineering	118	106	71	85	86	67
Agricultural sciences	32	24	25	21	31	22
Medical sciences-- outside medical school	28	32	41	36	39	41
Medical sciences-- medical schools	75	70	92	74	66	48
Biological sciences-- medical schools	44	44	59	53	57	51
Other, not elsewhere classified	17	17	23	8	8	8

[1] Psychology and social sciences were not differentiated in the questionnaire for the 1990-91 period.

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

Because of rounding, components may not add to totals.

In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F4-4. For projects to repair/renovate science and engineering research space, estimated net assignable square feet (NASF) of research space affected, and estimated total cost of this repair/renovation, by field: 1986-1995
[NASF in thousands; current dollars in millions]

Field	1986-1987		1988-1989		1990-1991		1992-1993		1994-1995		1996-1997 [Scheduled]	
	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost
Total	13,431	$838	11,449	$1,010	8,606	$826	9,134	$837	13,122	$1,058	13,698	$1,258
Biological sciences-- outside medical school	2,555	146	2,203	126	1,055	135	1,304	108	1,610	127	1,777	187
Physical sciences	1,746	105	1,928	165	1,680	151	1,725	134	2,474	192	1,991	241
Psychology	256	14	88	11	254 [1]	31 [1]	141	10	182	28	272	29
Social sciences	181	36	119	8			236	10	296	40	346	60
Mathematics	37	4	136	11	39	6	11	2	67	6	95	1
Computer sciences	193	17	144	9	164	21	54	4	124	8	142	13
Earth, atmospheric and ocean sciences	362	21	930	18	450	16	418	31	521	35	570	41
Engineering	2,716	141	1,630	361	1,159	82	1,932	139	1,803	150	2,410	222
Agricultural sciences	628	20	530	23	391	35	335	14	1,245	72	661	48
Medical sciences-- outside medical school	737	52	705	24	627	53	284	28	757	59	773	65
Medical sciences-- medical schools	2,499	174	1,598	161	1,443	166	1,678	234	3,129	226	3,058	132
Biological sciences-- medical schools	1,056	78	1,259	76	1,301	123	864	116	752	101	1,380	175
Other, not elsewhere classified	465	30	180	17	42	6	152	7	162	12	162	42

[1] Psychology and social sciences were not differentiated in the questionnaire item for the 1990-1991 period.

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 4 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F4-1. Number of institutions performing major repair/renovation of science and engineering research facilities by institution type and control: 1986-1995

Institution type and control	1986 - 1987	1988 - 1989	1990 or 1991	1992 - 1993	1994-1995	1996-1997 [Scheduled]
Total	288	248	244	252	252	243
Doctorate-granting	224	204	212	196	194	176
Top 100 in research expenditures	96	85	91	90	88	78
Other	128	119	121	106	106	98
Nondoctorate-granting	64	44	32	56	59	68
Public	210	164	155	137	149	132
Doctorate-granting	163	133	137	112	116	97
Nondoctorate-granting	47	31	17	25	33	35
Private	78	84	89	115	103	111
Doctorate-granting	61	71	75	84	77	78
Nondoctorate-granting	17	14	15	31	25	33

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F4-2. For major projects to repair/renovate science and engineering research space, estimated net assignable square feet (NASF) of research space affected and estimated total cost of this repair/renovation, by institution type and control, and year of project start: 1986-1995

[NASF in thousands; current dollars in millions]

Institution type and control	1986-1987		1988-1989		1990-1991		1992-1993		1994-1995		1996-1997 [Scheduled]	
	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost	NASF	Cost
Total	13,431	$838	11,449	$1,010	8,655	$826	9,133	$837	13,122	$1,058	13,698	$1,258
Doctorate-granting	12,841	793	10,993	979	8,352	794	8,811	803	12,364	981	13,051	1,161
Top 100 in research expenditures	9,124	596	7,781	483	5,622	633	6,028	623	8,758	755	9,014	889
Other	3,717	197	3,212	496	2,730	161	2,783	180	3,607	226	4,038	272
Nondoctorate-granting	590	45	456	30	303	32	323	34	758	77	646	97
Public	8,745	436	8,223	699	5,460	449	6,011	522	6,839	496	7,987	688
Doctorate-granting	8,307	399	7,890	674	5,295	431	5,877	508	6,242	450	7,567	636
Nondoctorate-granting	438	37	333	25	165	18	134	14	597	46	421	53
Private	4,685	402	3,226	311	3,195	376	3,123	315	6,283	562	5,710	570
Doctorate-granting	4,534	393	3,102	305	3,057	363	2,934	295	6,122	531	5,485	526
Nondoctorate-granting	152	9	123	6	137	14	189	20	161	31	226	44

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 4 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F3-3. Number of research-performing institutions starting any projects to construct science and engineering research space by field: 1986-1995

Field	*1986-1987*	*1988-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 [Scheduled]*
Total	192	227	191	184	164	160
Biological sciences--outside medical school	43	87	57	49	42	51
Physical sciences	41	67	50	44	49	37
Psychology	21	11	29[1]	8	8	5
Social sciences	19	13		10	15	11
Mathematics	3	5	13	5	4	5
Computer sciences	28	21	20	13	7	8
Earth, atmospheric and ocean sciences	28	17	42	26	15	18
Engineering	79	252	48	49	44	47
Agricultural sciences	36	32	28	32	25	27
Medical sciences--outside medical school	18	14	33	25	14	20
Medical sciences--medical school	42	35	62	41	31	30
Biological sciences--medical school	20	26	41	26	12	13
Other, not elsewhere classified	14	13	22	13	17	17

[1] Psychology and social sciences were not differentiated in the questionnaire item for the 1990-1991 period.

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.
Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.
In the biological and medical sciences, the total number of institutions is less than the sum of the subcategories because medical schools that are part of larger universities are not counted twice.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F3-4. For projects to construct science and engineering research space, estimated net assignable square feet (NASF) of research space to be created and estimated total cost of the construction of this research space by field: 1986-1996
[NASF in thousands; current dollars in millions]

	1986-1987		*1988-1989*		*1990-1991*		*1992-1993*		*1994-1995*		*1996-1997 [Scheduled]*	
Field	***NASF***	***Cost***	***NASF***	***Cost***	***NASF***	***Cost***	***NASF***	***Cost***	***NASF***	***Cost***	***NASF***	***Cost***
Total	9,922	$2,051	10,647	$2,464	11,433	$2,976	10,992	$2,812	9,521	$2,768	10,843	$3,072
Biological sciences--outside medical school	1,275	324	1,549	396	1,374	451	1,169	292	1,028	388	1,804	507
Physical sciences	799	182	2,000	401	1,609	430	1,257	337	1,551	426	1,153	390
Psychology	132	23	115	25	164[1]	36[1]	78	16	145	42	82	38
Social sciences	202	38	329	48			221	44	380	112	176	54
Mathematics	9	2	25	8	46	12	44	10	8	2	72	25
Computer sciences	237	61	286	65	293	40	172	47	143	46	121	31
Earth, atmospheric and ocean sciences	380	57	324	82	529	170	502	123	282	33	746	240
Engineering	2,390	430	1,490	388	1,697	395	1,065	286	2,174	575	2,122	429
Agricultural sciences	1,513	150	1,146	152	955	175	1,218	210	808	150	1,051	212
Medical sciences--outside medical school	613	203	306	61	673	151	669	160	388	122	926	243
Medical sciences--medical school	1,335	302	1,948	587	2,288	655	3,154	839	3,694	525	2,049	672
Biological sciences--medical school	433	139	712	181	1,426	381	1,020	341	579	226	465	214
Other, not elsewhere classified	603	139	418	70	380	79	420	106	340	122	77	16

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 3 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F4-5. Number of research-performing institutions and total project completion cost of all repair/renovation projects between $5,000 and $100,000 for science and engineering research facilities by institution type and control: 1994 and 1995
[Current dollars in millions]

Institution type and control	Number of institutions	Total completion costs
Total	281	$135.2
Doctorate-granting	213	129.2
Top 100 in research expenditures	75	102.1
Other	138	27.2
Nondoctorate-granting	69	6.0
Public	154	81.2
Doctorate-granting	122	77.8
Nondoctorate-granting	32	3.4
Private	127	54.1
Doctorate-granting	90	51.5
Nondoctorate-granting	37	2.6

NOTES: Project costs reflect research components only.

Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F5-1. **Research-performing institutions' amounts of funds for science and engineering research facility construction projects, by institution type and source of funds: 1986-1995**
[Current dollars in millions]

Year of project start and type of institution	All sources	*Government*		*Private donations*	*Institutional funds*	*Tax-exempt bonds*	*Other debt*	*Other sources*
		Federal	*State/local*					
1986 or 1987:								
Total	$2,050.6	$145.4	$779.1	$487.5	$289.8	$313.1	$3.1	$31.9
Doctorate-granting	1,887.7	129.9	690.4	462.5	289.2	280.1	3.1	31.9
Nondoctorate-granting	162.9	15.5	88.7	25.1	0.6	33.1	0.0	0.0
1988 or 1989:								
Total	2,464.5	352.0	890.7	459.2	343.8	320.2	95.9	0.8
Doctorate-granting	2,315.0	339.0	807.3	411.7	338.3	320.2	95.9	0.8
Nondoctorate-granting	149.5	13.0	83.4	47.5	5.6	0.0	0.0	0.0
1990 or 1991:								
Total	2,975.6	476.3	956.6	352.6	394.1	727.5	35.4	33.1
Doctorate-granting	2,847.3	465.5	947.9	348.0	390.3	627.0	35.4	33.1
Nondoctorate-granting	128.4	10.8	8.7	4.6	3.8	100.5	0.0	0.0
1992 or 1993:								
Total	2,810.8	459.3	968.0	301.0	374.3	620.3	39.0	50.0
Doctorate-granting	2,720.0	452.0	893.0	297.0	374.0	616.0	39.0	48.0
Nondoctorate-granting	91.8	7.3	75.0	4.0	0.3	4.3	0.0	2.0
1994 or 1995:								
Total	2,767.6	206.5	1,180.8	360.0	442.0	426.1	145.7	6.5
Doctorate-granting	2,436.9	201.2	890.4	344.0	437.5	411.6	145.7	6.5
Nondoctorate-granting	330.6	5.2	290.5	16.0	4.4	14.5	0.0	0.0

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of more than $100,000 for research-related space. Estimates are prorated to research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 5 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F5-6. Private research-performing institutions' amounts of funds for science and engineering research facility repair/renovation projects, by institution type and source of funds: 1986-1995

[Current dollars in millions]

Year of project start and type of institution	*All sources*	*Government*		*Private donations*	*Institutional funds*	*Tax-exempt bonds*	*Other debt*	*Other sources*
		Federal	*State/local*					
1986 or 1987:								
Total	$402.0	$14.1	$6.5	$86.0	$172.9	$112.1	$3.5	$7.2
Doctorate-granting	393.4	12.6	6.6	85.0	171.8	107.2	3.5	7.2
Nondoctorate-granting	8.6	1.5	0.0	1.0	1.2	4.9	0.0	0.0
1988 or 1989:								
Total	311.0	29.7	4.5	30.1	167.3	63.3	11.0	5.2
Doctorate-granting	305.3	29.4	4.5	28.2	163.8	63.3	11.0	5.2
Nondoctorate-granting	5.7	0.2	0.0	1.9	3.6	0.0	0.0	0.0
1990 or 1991:								
Total	376.4	24.4	9.5	56.8	220.8	54.3	8.0	2.6
Doctorate-granting	362.8	24.4	9.5	53.7	213.6	51.1	8.0	2.6
Nondoctorate-granting	13.6	0.0	0.0	3.2	7.2	3.3	0.0	0.0
1992 or 1993:								
Total	314.6	21.8	15.0	47.5	176.3	24.5	25.2	4.3
Doctorate-granting	294.7	16.0	15.0	40.7	170.5	22.9	25.2	4.2
Nondoctorate-granting	19.9	5.8	0.0	6.8	5.8	1.6	0.0	0.1
1994 or 1995:								
Total	562.3	71.8	11.2	94.8	271.9	32.2	77.7	2.8
Doctorate-granting	531.4	70.1	10.7	78.0	268.8	25.6	75.4	2.8
Nondoctorate-granting	30.8	1.6	0.5	16.8	3.0	6.6	2.4	0.0

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of more than $100,000 for research-related space. Estimates are prorated to research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 5 of this report.

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F5-7. Number of private research-performing institutions, by status relative to the $150 million limit on institution tax-exempt bonds: 1988, 1990, 1992, 1994 and 1996

Status relative to the $150 million limit on tax-exempt bond	***Total***					***Doctorate-granting***					***Nondoctorate-granting***				
	1988	***1990***	***1992***	***1994***	***1996***	***1988***	***1990***	***1992***	***1994***	***1996***	***1988***	***1990***	***1992***	***1994***	***1996***
Total	205	206	206	220	218	103	103	102	124	126	103	103	104	96	92
Have reached the limit	20	23	28	28	32	20	23	28	28	28	0	0	0	0	3
Have not, but expect to reach the limit in the next 2 fiscal years	9	12	2	12	5	8	12	2	7	5	1	0	0	5	0
Have not, and do not expect to reach the limit in the next 2 fiscal years	176	171	176	180	182	75	68	72	88	93	102	103	104	92	89

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F5-4. Research-performing institutions' amounts of funds for science and engineering research facility repair/renovation projects, by institution type and source of funds: 1986-95

[Current dollars in millions]

Year of project start and type of institution	*All sources*	*Government*		*Private donations*	*Institutional funds*	*Tax-exempt bonds*	*Other debt*	*Other sources*
		Federal	*State/local*					
1986 or 1987:								
Total	$837.9	$27.3	$233.1	$101.0	$328.0	$137.6	$3.8	$7.4
Doctorate-granting	792.7	23.5	201.7	99.3	325.2	132.2	3.8	7.4
Nondoctorate-granting	45.2	3.7	31.4	1.6	3.0	5.4	0.0	0.0
1988 or 1989:								
Total	1,009.5	61.1	233.8	52.1	570.8	69.9	15.9	5.2
Doctorate-granting	979.2	55.9	226.6	42.1	563.6	69.8	15.9	5.2
Nondoctorate-granting	30.3	5.1	7.1	10.0	7.2	0.0	0.0	0.0
1990 or 1991:								
Total	825.7	49.0	243.0	100.6	355.4	66.4	8.0	3.2
Doctorate-granting	794.1	48.3	227.3	97.5	346.7	63.2	8.0	3.2
Nondoctorate-granting	31.6	0.7	15.8	3.2	8.7	3.3	0.0	0.0
1992 or 1993:								
Total	835.4	56.2	252.4	73.0	332.0	81.0	27.0	16.2
Doctorate-granting	803.0	47.0	244.0	66.0	325.0	79.0	27.0	16.2
Nondoctorate-granting	32.4	9.2	8.4	7.0	7.0	2.0	0.0	0.0
1994 or 1995:								
Total	1,058.1	110.7	265.5	110.7	432.7	50.4	78.6	9.3
Doctorate-granting	981.3	101.9	233.0	93.7	423.2	43.8	76.3	9.3
Nondoctorate-granting	76.8	8.8	32.6	17.0	9.5	6.6	2.4	0.0

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of more than $100,000 for research-related space. Estimates are prorated to research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 5 of this report.

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F5-5. Public research-performing institutions' amounts of funds for science and engineering research facility repair/renovation projects, by institution type and source of funds: 1986-1995
[Current dollars in millions]

Year of project start and type of institution	All sources	Government		Private donations	Institutional funds	Tax-exempt bonds	Other debt	Other sources
		Federal	State/local					
1986 or 1987:								
Total	$435.9	$13.2	$226.6	$15.0	$155.1	$25.5	$0.3	$0.2
Doctorate-granting	399.3	10.9	195.1	14.3	153.4	25.0	0.3	0.2
Nondoctorate-granting	36.6	2.2	31.4	0.6	1.8	0.5	0.0	0.0
1988 or 1989:								
Total	698.5	31.4	229.3	22.0	403.5	6.6	4.9	0.0 0.0
Doctorate-granting	673.9	26.5	222.1	13.9	399.8	6.5	4.9	0.0
Nondoctorate-granting	24.6	4.9	7.1	8.1	3.6	0.0	0.0	0.0
1990 or 1991:								
Total	449.3	24.6	233.5	43.8	134.6	12.1	0.0	0.6
Doctorate-granting	431.3	23.9	217.8	43.8	133.1	12.1	0.0	0.6
Nondoctorate-granting	18.0	0.7	15.8	0.0	1.5	0.0	0.0	0.0
1992 or 1993:								
Total	520.4	34.3	237.1	24.9	154.4	55.9	1.6	11.9
Doctorate-granting	507.9	31.1	228.5	24.9	153.8	55.9	1.6	11.9
Nondoctorate-granting	12.4	3.2	8.6	0.0	0.6	0.0	0.0	0.0
1994 or 1995:								
Total	495.8	38.9	254.4	16.0	160.8	18.3	0.9	6.5
Doctorate-granting	449.9	31.8	222.3	15.7	154.4	18.3	0.9	6.5
Nondoctorate-granting	45.9	7.1	32.1	0.2	6.5	0.0	0.0	0.0

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of more than $100,000 for research-related space. Estimates are prorated to research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 5 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F5-2. Public research-performing institutions' amounts of funds for science and engineering research facility construction projects, by institution type and source of funds: 1986-1995
[Current dollars in millions]

Year of project start and type of institution	*All sources*	*Government*		*Private donations*	*Institutional funds*	*Tax-exempt bonds*	*Other debt*	*Other sources*
		Federal	*State/local*					
1986 or 1987:								
Total	$1,354.8	$40.3	$754.5	$259.1	$109.2	$189.5	$2.4	$0.2
Doctorate-granting	1,220.4	31.4	665.9	238.6	109.2	173.1	2.4	0.2
Nondoctorate-granting	134.4	8.9	88.5	20.6	0.0	16.4	0.0	0.0
1988 or 1989:								
Total	1,727.0	274.3	838.4	192.9	256.3	154.5	8.1	0.6
Doctorate-granting	1,625.6	268.3	755.0	184.8	252.4	154.6	8.1	0.6
Nondoctorate-granting	101.4	6.0	83.4	8.1	3.9	0.0	0.0	0.0
1990 or 1991:								
Total	2,020.0	388.1	809.4	139.1	270.2	398.6	7.8	6.9
Doctorate-granting	1,906.4	382.3	800.7	139.1	270.2	299.4	7.8	6.9
Nondoctorate-granting	113.7	5.8	8.7	0.0	0.0	99.2	0.0	0.0
1992 or 1993:								
Total	2,016.4	325.8	929.8	152.5	198.3	390.5	16.2	3.3
Doctorate-granting	1,929.9	320.1	854.4	152.5	198.1	386.9	16.2	1.7
Nondoctorate-granting	86.4	5.7	75.4	0.0	0.2	3.6	0.0	1.6
1994 or 1995:								
Total	1,872.3	115.4	1,164.6	123.9	142.4	306.1	13.5	6.5
Doctorate-granting	1,578.1	112.5	874.0	123.9	141.6	306.1	13.5	6.5
Nondoctorate-granting	294.2	3.0	290.5	0.0	0.8	0.0	0.0	0.0

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of more than $100,000 for research-related space. Estimates are prorated to research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 5 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F5-3. Private research-performing institutions' amounts of funds for science and engineering research facility construction projects, by institution type and source of funds: 1986-1995

[Current dollars in millions]

Year of project start and type of institution	All sources	Government		Private donations	Institutional funds	Tax-exempt bonds	Other debt	Other sources
		Federal	*State/local*					
1986 or 1987:								
Total	$695.8	$105.1	$24.6	$228.4	$180.6	$123.6	$0.7	$31.7
Doctorate-granting	667.3	98.5	24.5	223.9	180.0	107.0	0.7	31.7
Nondoctorate-granting	28.5	6.6	0.2	4.5	0.6	16.7	0.0	0.0
1988 or 1989:								
Total	737.5	77.7	52.3	266.3	87.5	165.7	87.8	0.2
Doctorate-granting	689.4	70.7	52.3	226.9	85.9	165.6	87.8	0.2
Nondoctorate-granting	48.1	7.0	0.0	39.4	1.7	0.0	0.0	0.0
1990 or 1991:								
Total	955.6	88.2	147.2	213.5	123.9	328.9	27.6	26.2
Doctorate-granting	940.9	83.2	147.2	208.9	120.1	327.6	27.6	26.2
Nondoctorate-granting	14.7	5.0	0.0	4.6	3.8	1.3	0.0	0.0
1992 or 1993:								
Total	795.5	133.5	38.8	148.5	176.1	229.6	22.7	46.4
Doctorate-granting	789.7	132.2	38.8	144.6	175.8	229.3	22.7	46.4
Nondoctorate-granting	5.8	1.3	0.0	3.9	0.3	0.3	0.0	0.0
1994 or 1995:								
Total	895.2	91.0	16.3	236.1	299.5	120.0	132.2	0.0
Doctorate-granting	858.8	88.8	16.3	220.1	295.9	105.5	132.2	0.0
Nondoctorate-granting	36.3	2.2	0.0	16.0	3.6	14.5	0.0	0.0

NOTES: All 1996 data are national estimates derived from samples representing the 560 largest research-performing U.S. colleges and universities; 1994 data represent 565 institutions; all previous years' data (1988, 1990, 1992) represent 525 institutions.

Findings are limited to projects with estimated total costs at completion of more than $100,000 for research-related space. Estimates are prorated to research components only.

Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 5 of this report.

SOURCE: National Science Foundation/SRS, *1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F6-1. Percentage of institutions with need for capital projects to construct and/or to repair/renovate science and engineering (S&E) research facilities, as identified in an institutional plan or not in a plan, by institution type, project type and control: 1996

Institution type	*Needs in a plan*			*Needs not in a plan*		
	Need to construct or repair/renovate	*Construct*	*Repair/renovate*	*Need to construct or repair/renovate*	*Construct*	*Repair/renovate*
Total	44%	23%	36%	24%	11%	22%
Doctorate-granting	52	30	42	26	11	24
Top 100 in research expenditures	71	53	62	35	23	33
Other	43	19	33	22	6	19
Nondoctorate-granting	34	15	28	23	10	20
Public	45	31	35	23	11	19
Doctorate-granting	55	44	43	25	12	24
Nondoctorate-granting	32	15	23	19	10	14
Private	43	13	38	27	10	25
Doctorate-granting	48	10	42	26	9	24
Nondoctorate-granting	37	16	33	27	10	27

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F6-2. Expenditures for needed capital projects to construct or repair/renovate science and engineering (S&E) research facilities, as identified in an institutional plan or not in a plan, by institution type, project type and control: 1996

[Current dollars in millions]

Institution type	*In a plan*		*Not in a plan*		*Total*
	To construct S&E research facilities	*To repair/renovate S&E research facilities*	*To construct S&E research facilities*	*To repair/renovate S&E research facilities*	
Total	$4,629.0	$2,790.0	$1,046.4	$875.9	$9,341.3
Doctorate-granting	4,306.8	2,495.0	1,004.5	762.7	8,569.0
Top 100 in research expenditures	3,480.3	1,653.4	903.6	601.1	6,638.4
Other	826.6	841.6	100.8	161.6	1,930.6
Nondoctorate-granting	322.2	295.0	41.9	113.2	772.3
Public	4,165.7	2,001.1	821.3	676.1	7,664.2
Doctorate-granting	3,929.4	1,809.9	783.5	597.7	7,120.5
Nondoctorate-granting	236.3	191.2	37.9	78.4	543.8
Private	463.3	788.9	225.0	199.8	1,677.0
Doctorate-granting	377.5	685.1	221.0	165.0	1,448.6
Nondoctorate-granting	85.9	103.8	4.0	34.8	228.5

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F6-3. Number of institutions with need for capital projects to construct or repair/renovate science and engineering (S&E) research facilities, as identified in an institutional plan or not in a plan, by field and and project type: 1996

Field	*In a plan*		*Not in a plan*	
	To construct S&E research facilities	*To repair/renovate S&E research facilities*	*To construct S&E research facilities*	*To repair/renovate S&E research facilities*
Biological sciences outside medical school	50	88	27	71
Physical sciences	65	110	16	58
Psychology	10	32	13	29
Social sciences	11	26	16	36
Mathematics	7	33	10	19
Computer sciences	6	27	19	22
Earth, atmospheric, and ocean sciences	15	56	13	16
Engineering	61	76	11	25
Agricultural sciences	25	21	12	16
Medical sciences outside medical school	23	31	15	29
Medical sciences medical schools	16	35	4	14
Biological sciences medical schools	12	37	3	12
Other, not elsewhere classified	9	32	3	6

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F6-4. Expenditures for needed capital projects to construct or repair/renovate science and engineering (S&E) research facilities, as identified in an institutional plan or not in a plan, by field: 1996

Field	*In a plan*		*Not in a plan*		*Total*
	To construct S&E research facilities	*To repair/renovate S&E research facilities*	*To construct S&E research facilities*	*To repair/renovate S&E research facilities*	
Total	$4,629,012.4	$2,790,044.2	$1,046,350.2	$875,885.1	$9,341,291.9
Biological sciences--outside medical school	638,820.8	508,097.0	150,909.7	147,571.9	1,445,399.4
Physical sciences	1,065,307.7	587,344.9	109,687.4	94,906.2	1,857,246.2
Psychology	55,320.6	41,043.4	28,811.4	10,030.1	135,205.5
Social sciences	141,908.7	64,485.0	42,900.5	56,542.7	305,836.9
Mathematics	55,944.2	52,630.8	3,408.3	11,145.3	123,128.6
Computer sciences	86,088.7	22,033.0	33,499.2	11,297.3	152,918.2
Earth, atmospheric, and ocean sciences	377,487.4	165,671.5	95,938.6	27,688.4	666,785.9
Engineering	727,087.6	525,313.6	179,511.4	90,978.0	1,522,890.6
Agricultural sciences	356,487.6	144,548.5	159,739.9	147,542.8	808,318.8
Medical sciences--outside medical school	238,171.5	113,803.8	90,235.1	76,259.3	518,469.7
Medical sciences--medical schools	660,194.8	403,880.2	107,030.7	90,308.0	1,261,413.7
Biological sciences--medical schools	166,230.3	101,984.2	33,911.9	71,836.3	373,962.7
Other, not elsewhere classified	59,962.4	57,208.2	10,766.2	39,778.8	167,715.6

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F7-1. Total number of Historically Black Colleges and Universities (HBCUs) by type and control: 1996

Institution type and control	*Original group 1996* [1]	*Expanded group 1996*
Number of research-performing HBCUs	29	68
Public		
Doctorate-granting	5	5
Nondoctorate-granting	17	34
Private		
Doctorate-granting	4	5
Nondoctorate-granting	3	24

[1] The original group consists of the 29 HBCUs also surveyed in 1988, 1990, and 1994; the expanded group is the 1996 population of all 68 research-performing HBCUs.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-2. Total net assignable square feet (NASF) of academic space, total NASF in science and engineering (S&E) fields, and research NASF in S&E fields, in Historically Black Colleges and Universities (HBCUs); original and expanded groups of institutions: 1996

[NASF in millions]

	Original group 1996[1]	*Expanded group 1996*
Number of research-performing HBCUs	29	68
Total academic space[2]	15	20
Space in S&E fields	7	9
Space used for research in S&E fields	2	2

[1] The original group consists of the 29 HBCUs also surveyed in 1988, 1990, and 1994; the expanded group is the 1996 population of all 68 research-performing HBCUs.

[2] Projected from responses of 76 percent of original group and 86 percent of expanded group.

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-3. Total net assignable square feet (NASF) of space in science and engineering (S&E) fields and NASF used for research in Historically Black Colleges and Universities (HBCUs): 1988, 1990, 1992, 1994 and 1996
[NASF in thousands]

Field	*Total NASF in S&E fields*					*Research NASF in S&E fields*				
	1988	*1990*	*1992 [Original]* [1]	*1994 [Original]* [1]	*1996 [Original]* [1]	*1988*	*1990*	*1992 [Original]* [1]	*1994 [Original]* [1]	*1996 [Original]* [1]
Number of research-performing HBCUs	29	29	29	28	29	29	29	29	28	29
Total	6,077	6,175	6,576	6,084	6,755	1,112	1,440	1,782	1,759	1,797
Biological sciences--outside medical school	509	546	621	581	634	141	170	254	250	208
Physical sciences	804	810	1,005	876	939	179	190	235	212	229
Psychology	119	105	86	106	134	14	19	16	18	16
Social sciences	304	322	278	233	268	28	47	57	43	56
Mathematics	173	164	191	158	194	12	26	29	19	24
Computer sciences	150	114	160	128	140	43	30	42	31	36
Earth, atmospheric and ocean sciences	44	56	85	73	115	10	26	35	27	42
Engineering	777	979	1,207	1,136	1,354	152	167	285	315	349
Agricultural sciences	604	834	783	704	718	259	433	414	470	451
Medical sciences--outside medical school	593	956	963	913	719	37	50	133	134	63
Medical sciences--medical school	1,253	810	810	649	872	141	158	160	69	84
Biological sciences--medical school	621	388	388	456	470	91	121	121	159	150
Other, not elsewhere classified	126	91	0	70	198	4	4	0	12	88

[1] The original group consists of the 29 HBCUs surveyed in 1988, 1990, 1992, 1994 and 1996. One HBCU did not have R&D expenditures in 1994.

NOTE: Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, *1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-4. Total net assignable square feet (NASF) of space in science and engineering (S&E) fields and NASF used for research in Historically Black Colleges and Universities (HBCUs): 1988, 1990, 1992, 1994 and 1996

[NASF in thousands]

Field	*Total NASF in S&E fields*					*Research NASF in S&E fields*				
	1988	***1990***	***1992 [Expanded]*** [1]	***1994 [Expanded]*** [1]	***1996 [Expanded]*** [1]	***1988***	***1990***	***1992 [Expanded]*** [1]	***1994 [Expanded]*** [1]	***1996 [Expanded]*** [1]
Number of research-performing HBCUs	29	29	70	70	68	29	29	70	70	68
Total	6,077	6,175	9,095	7,923	8,984	1,112	1,440	2,920	2,197	2,374
Biological sciences—outside medical school	509	546	1,757	1,063	1,182	141	170	1,137	480	393
Physical sciences	804	810	1,380	1,344	1,482	179	190	275	280	352
Psychology	119	105	173	222	219	14	19	25	33	31
Social sciences	304	322	438	367	413	28	47	78	61	77
Mathematics	173	164	325	362	345	12	26	34	38	44
Computer sciences	150	114	283	278	356	43	30	53	52	64
Earth, atmospheric and ocean sciences	44	56	131	97	219	10	26	64	36	54
Engineering	777	979	1,353	1,278	1,445	152	167	302	355	364
Agricultural sciences	604	834	930	705	979	259	433	497	483	595
Medical sciences—outside medical school	593	956	1,070	989	799	37	50	147	141	77
Medical sciences—medical schools	1,253	810	862	649	872	141	158	187	69	84
Biological sciences—medical schools	621	388	388	456	470	91	121	121	159	150
Other, not elsewhere classified	126	91	5	109	202	4	4	0	14	88

[1] The original group consists of the 29 HBCUs surveyed in 1988, 1990, 1992; the expanded group is the 1994 and 1996 population of all 70 research-performing HBCUs. Two HBCUs did not have R&D expenditures in 1996.

NOTE: Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS. 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-5. Condition of research facilities at Historically Black Colleges and Universities (HBCUs): 1988, 1990, 1992, 1994 and 1996
[percentage of research space]

Condition of research facilities	*1988*	*1990*	*1992* [1]	*1992 Expanded*	*1994* [1]	*1994 Expanded*	*1996* [1,3]	*1996 Expanded* [1]
Total	100	100	100	100	100	100	100	100
Suitable for most highly developed and scientifically sophisticated research	36	31	34	22	31	24	32	31
Effective for most purposes	39	45	41	56	39	35	56	55
Requires limited repair or renovation	18	18	17	14	21	25		
Requires major repair or renovation [2]	7	7	8	8	9	16	13	14

[1] Data are based on reduced sample to correspond to 1988 and 1990 surveys.

[2] Includes research space that requires replacement.

[3] 1996 survey response categories changed to: suitable for the most scientifically competitive research; effective for most levels of research, but may need limited repair/renovation; and requires major renovation or replacement to be used effectively.

NOTE: Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-6. Science and engineering research facility construction and repair/renovation projects at Historically Black Colleges and Universities (HBCUs), by project characteristics: 1986-1995

Capital Project Activity	*Original*[1]						*Expanded*[1]			
	1986-1987	*1998-1989*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 (scheduled)*	*1990-1991*	*1992-1993*	*1994-1995*	*1996-1997 (scheduled)*
Construction Projects: [2]										
Number of HBCUs with projects	11	10	6	4	4	11	10	9	13	17
Total project completion cost (current dollars in millions)	$72	$55	$23	$9	$3	$38	$38	$29	$21	$54
NASF (in thousands)	481	319	328	88	68	181	449	226	166	253
Repair/Renovation projects costing $100,000: [2]										
Number of HBCUs with projects	13	10	5	11	7	9	8	12	9	23
Total project completion cost (in millions)	$14	$17	$12	$9	$22	$8	$21	$9	$22	$23
NASF (in thousands)	137	308	129	106	343	166	177	110	347	207
Repair/Renovation projects costing $5,000-$100,000:										
Number of HBCUs with projects	-	-	10	13	11	-	21	38	24	-
Total project completion cost (in millions)	-	-	$0.6	$3.3	$0.8	-	$1.1	$26.0	$1.6	-

[1] The original group consists of the 29 HBCUs also surveyed in 1988, 1990, 1992, 1994 and 1996; the expanded group is the 1996 population of all 70 research-performing HBCUs. In 1996, two HBCUs did not have R&D expenditures.

[2] Findings are limited to projects with estimated total cost at completion of over $100,000 for research space. Estimates are prorated to reflect research components only.

NOTES: Because of rounding, components may not add to totals.
Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 7 of this report.

KEY: NASF = net assignable square feet

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-7. Source of funds for science and engineering research facility construction projects at Historically Black Colleges and Universities (HBCUs): 1986-1995

[Current dollars in millions]

Source of funds	*1986-1987*[1]	*1998-1989*[1]	*1990-1991*[1] [Original][2]	*1990-1991*[1] [Expanded][2]	*1992-1993* [Original][2]	*1992-1993* [Expanded][2]	*1994-1995* [Original][2]	*1994-1995* [Expanded][2]
Number of institutions	29	29	29	70	28	68[3]	29	68[3]
Total	$71.8	$55.1	$22.5	$37.6	$8.6	$28.8	$3.3	$21.3
Federal government	32.7	35.0	12.1	13.0	6.5	4.6	1.3	3.3
State/local government	25.8	11.5	6.3	18.0	2.0	22.4	2.0	16.8
Private donations	11.1	7.7	0.0	0.0	0.0	0.0	0.0	0.3
Institutional funds	2.3	0.9	4.2	4.6	0.0	0.2	0.0	0.9
Debt financing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tax-exempt bonds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other debt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other sources	0.0	0.0	0.0	1.9	0.0	1.6	0.0	0.0

[1] Data for the first two time periods were heavily inflated by construction activity at a single institution, which accounted for a substantial fraction of the total dollar amount shown.

[2] The original group consists of the 29 HBCUs also surveyed in 1988, 1990, 1992 and 1994; the expanded group is the 1996 population of all 70 research-performing HBCUs.

[3] Two of the HBCUs were determined to be out of scope since they had no S&E research space; data are weighted to 28 in the original panel and 68 in the expanded group.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only. Because of rounding, components may not add to totals.
Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 7 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-8. Sources of funds for science and engineering research facilities repair/renovation projects at Historically Black Colleges and Universities (HBCUs): 1986-1995
[Current dollars in millions]

Source of funds	*1986-1987*	*1998-1989*	*1990-1991* [Original]	*1990-1991* [Expanded] [1]	*1992-1993* [Original]	*1992-1993* [Expanded] [1]	*1994-1995* [Original]	*1994-1995* [Expanded] [1]
Number of institutions	29	29	29	70	28	68 [2]	29	68
Total	14.1	16.6	11.6	21.4	8.7	9.1	21.5	22.0
Federal government	8.7	12.9	3.5	3.6	5.0	4.8	10.2	10.4
State/local government	4.9	8.0	8.0	17.7	2.1	2.1	6.4	6.6
Private donations	0.5	0.1	0.1	0.2	1.7	1.7	0.0	0.0
Institutional funds	0.0	0.1	0.1	0.1	0.1	0.4	2.6	2.6
Debt financing	0.0	0.0	0.0	0.0	0.0	0.0	2.4	2.4
Tax-exempt bonds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other debt	0.0	0.0	0.0	0.0	0.0	0.0	2.4	2.4
Other sources	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[1] The original group consists of the 29 HBCUs also surveyed in 1988, 1990, 1992 and 1994; the expanded group is the 1996 population of all 70 research-performing HBCUs.

[2] Two of the HBCUs were determined to be out of scope since they had no S&E research space; data are weighted to 28 in the original panel and 68 in the expanded group.

NOTES: Findings are limited to projects with estimated total cost at completion of $100,000 or more for research space. Estimates are prorated to reflect research components only.
Because of rounding, components may not add to totals.
Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 7 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-9. Original[1] Historically Black Colleges and Universities (HBCUs) with need for capital projects to construct or repair/renovate science and engineering (S&E) research facilities, as identified in an institutional plan and not in a plan, by field and project type: 1996

[Current dollars in millions]

Field	*In a plan*				*Not in a plan*			
	Number of institutions with need to construct	*Cost*	*Number of institutions with need to repair/renovate*	*Cost*	*Number of institutions with need to construct*	*Cost*	*Number of institutions with need to repair/renovate*	*Cost*
Total	10	$159,297.2	8	$11,822.7	4	$19,060.0	3	$703.0
Biological sciences--outside medical school	2	6,365.0	1	1,296.9	1	8,000.0	1	155.0
Physical sciences	5	26,000.0	3	1,544.8	1	10,000.0	1	150.0
Psychology	1	150.0	1	723.1	0	0.0	1	32.0
Social sciences	2	22,755.8	1	80.0	1	200.0	1	217.0
Mathematics	1	15,944.4	1	40.0	1	240.0	0	0.0
Computer sciences	1	6,000.0	3	456.0	1	120.0	1	50.0
Earth, atmospheric and ocean sciences	1	3,680.0	0	0.0	0	0.0	0	0.0
Engineering	3	43,150.0	2	362.0	0	0.0	0	0.0
Agricultural sciences	2	2,652.0	0	0.0	1	150.0	1	54.0
Medical sciences--outside medical school	3	24,500.0	1	120.0	1	350.0	0	0.0
Medical sciences--medical school	0	0.0	0	0.0	0	0.0	0	0.0
Biological sciences--medical school	1	1,500.0	2	6,200.0	0	0.0	1	30.0
Other, not elsewhere classified	1	6,600.0	1	1,000.0	0	0.0	1	15.0

[1] The original group consists of the 29 HBCUs also surveyed in 1988, 1990, 1992 and 1994.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

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Table F7-10. Expanded[1] Historically Black Colleges and Universities (HBCUs) with need for capital projects to construct or repair/renovate science and engineering (S&E) research facilities, as identified in an institutional plan and not in a plan, by field and project type: 1996

[Current dollars in millions]

Field	*In a plan*				*Not in a plan*			
	Number of institutions with need to construct	*Cost*	*Number of institutions with need to repair/renovate*	*Cost*	*Number of institutions with need to construct*	*Cost*	*Number of institutions with need to repair/renovate*	*Cost*
Total	11	$159,640.1	19	$74,771.5	13	$35,920.6	20	$30,891.2
Biological sciences--outside medical school	3	6,708.7	7	7,889.3	8	9,335.8	17	7,899.7
Physical sciences	5	26,000.0	13	17,355.1	4	10,833.2	17	14,737.3
Psycholog	1	150.0	3	813.1	5	474.9	1	32.0
Social sciences	2	22,755.8	1	80.0	5	361.9	5	273.2
Mathematics	1	15,944.4	8	18,153.8	1	240.0	6	1,884.1
Computer sciences	1	6,000.0	5	2,463.7	5	794.7	5	265.9
Earth, atmospheric and ocean sciences	1	3,680.0	5	5,368.7	0	0.0	0	0.0
Engineering	3	43,150.0	9	14,687.8	0	0.0	0	0.0
Agricultural sciences	2	2,652.0	0	0.0	2	13,530.0	2	5,554.0
Medical sciences--outside medical school	3	24,500.0	2	760.0	1	350.0	1	200.0
Medical sciences--medical school	0	0.0	0	0.0	0	0.0	0	0.0
Biological sciences--medical school	1	1,500.0	2	6,200.0	0	0.0	1	30.0
Other, not elsewhere classified	1	6,600.0	1	1,000.0	0	0.0	1	15.0

[1] The expanded group is the 1996 population of all 68 research-performing HBCUs.

NOTES: Because of rounding, components may not add to totals.

Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 7 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F7-11. Laboratory animal facilities at Historically Black Colleges and Universities (HBCUs): 1996

Indicator	*Original group* [1]	*Expanded group* [1]
Total animal research NASF (in thousands)	223,209	239,688
Animal laboratory NASF (in thousands)	81,231	88,928
Animal housing NASF (in thousands)	141,978	150,759
Regulation status (in percentage of NASF):		
Fully meets government regulations	65.1%	65.5%
Needs limited repair to meet regulations	1.3	2.0
Needs major work or replacement to meet regulations	33.6	32.5
Cost of scheduled construction and repair/renovation of laboratory animal facilities, FY 1996 or FY 1997 (dollars in thousands)	$203,000	$203,000
NASF of scheduled construction and repair/renovation of laboratory animal facilities, FY 1996 or FY 1997 (NASF in thousands)	3,200	3,200

[1] The original group consists of the 29 HBCUs also surveyed in 1988, 1990, and 1992; the expanded group is the 1994 population of all 68 research-performing HBCUs.

NOTE: Because of rounding, components may not add to 100.

KEY: NASF = net assignable square feet

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Table F8-1. Number of institutions with science and engineering (S&E) research space at nondoctorate-granting institutions[1] by field: 1996

Field	*Comprehensive universities*	*Liberal arts colleges*
Total	177	65
Biological sciences	164	59
Physical sciences	159	59
Psychology	126	47
Social sciences	111	42
Mathematics	85	35
Computer sciences	99	32
Earth, atmospheric and ocean sciencies	67	29
Engineering	73	6
Agricultural sciences	42	3
Medical sciences	62	0
Other, not elsewhere classified	11	4

[1] The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities, those that offer a liberal arts program along with other programs such as engineering, business administration, or nursing; and liberal arts colleges, those that primarily award bachelor's degrees and that grant more than half of their degrees in the liberal arts.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F8-2. Condition of science and engineering research space in nondoctorate-granting institutions[1] by type: 1996

[Percentage of space]

	Total research NASF (in millions)	*Suitable for most scientifically competitive research*	*Effective for most uses, but may need limited repair/renovation*	*Requires major renovation or replacement*
Total: All nondoctorates	5.80	24%	57%	18%
Comprehensive universities	4.44	20	60	19
Liberal arts colleges	1.36	36	48	17

[1] The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities, those that offer a liberal arts program along with other programs such as engineering, business administration, or nursing; and liberal arts colleges, those that primarily award bachelor's degrees and that grant more than half of their degrees in the liberal arts.

NOTE: Because of rounding, components may not add to 100.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F8-3. For projects to construct science and engineering research facilities at nondoctorate-granting institutions,[1] the number of institutions and estimated total cost of projects by field and institution type

[Current dollars in millions]

Field	*Comprehensive universities*		*Liberal arts colleges*	
	Number of institutions	*Cost*	*Number of institutions*	*Cost*
Total	20	$294.5	13	$36.1
Biological sciences	7	128.6	10	32.0
Physical sciences	9	93.3	4	3.5
Psychology	0	0.0	0	0.0
Social sciences	1	0.6	0	0.0
Mathematics	1	0.4	0	0.0
Computer sciences	0	0.0	0	0.0
Earth, atmospheric and ocean sciencies	2	14.5	1	0.7
Engineering	0	0.0	0	0.0
Agricultural sciences	4	4.0	0	0.0
Medical sciences	3	30.3	0	0.0
Other, not elsewhere classified	6	22.7	0	0.0

[1] The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities, those that offer a liberal arts program along with other programs such as engineering, business administration, or nursing; and liberal arts colleges, those that primarily award bachelor's degrees and that grant more than half of their degrees in the liberal arts.

NOTE: Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 8 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F8-4. For projects to repair/renovate science and engineering research facilities at nondoctorate-granting institutions,[1] the number of institutions and estimated total cost of projects by field and institution type

[Current dollars in millions]

Field	*Comprehensive universities*		*Liberal arts colleges*	
	Number of institutions	*Cost*	*Number of institutions*	*Cost*
Total	38	$51.1	21	$25.7
Biological sciences	12	8.2	10	8.2
Physical sciences	10	9.5	9	9.5
Psychology	0	0.0	4	3.4
Social sciences	6	11.8	9	2.4
Mathematics	0	0.0	3	0.7
Computer sciences	2	0.6	6	1.2
Earth, atmospheric and ocean sciencies	5	4.7	0	0.0
Engineering	7	14.8	2	0.3
Agricultural sciences	5	1.0	0	0.0
Medical sciences	0	0.0	0	0.0
Other, not elsewhere classified	1	0.4	0	0.0

[1] The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities, those that offer a liberal arts program along with other programs such as engineering, business administration, or nursing; and liberal arts colleges, those that primarily award bachelor's degrees and that grant more than half of their degrees in the liberal arts.

NOTE: Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 8 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F8-5. Expenditures for needed capital projects to construct or repair/renovate S&E research facilities at nondoctorate-granting institutions,[1] by institution type, project type, and whether included in an institutional plan: 1996

[Current dollars in millions]

Institution Type	*Included in Institutional Plans*		*Not Included in Institutional Plans*		*Total*
	To construct new S&E research facilities	*To repair/renovate existing S&E research facilities*	*To construct new S&E research facilities*	*To repair/renovate existing S&E research facilities*	
Total: All nondoctorates	322.2	295.0	41.9	113.2	772.3
Comprehensive universities	249.3	194.8	38.5	93.2	575.8
Liberal arts colleges	72.9	100.2	3.4	20.0	196.5

[1] The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities, those that offer a liberal arts program along with other programs such as engineering, business administration, or nursing; and liberal arts colleges, those that primarily award bachelor's degrees and that grant more than half of their degrees in the liberal arts.

NOTE: Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 8 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F8-6. Expenditures for needed capital projects to construct S&E research facilities, as identified in an institutional plan and not in a plan, at nondoctorate-granting institutions,[1] by institution type and field: 1996
[Current dollars in millions]

Field	Comprehensive universities		Liberal arts colleges		Total
	In a plan	Not in a plan	In a plan	Not in a plan	
Total	$249.3	$38.5	$72.9	$3.4	$364.1
Biological sciences	35.5	10.4	11.3	0.5	
Physical sciences	72.4	11.6	25.1	0.0	109.1
Psychology	0.2	0.4	24.4	0.2	25.2
Social sciences	22.8	0.9	2.9	0.2	26.8
Mathematics	15.9	0.3	3.0	0.0	19.2
Computer sciences	0.0	1.0	0.0	0.8	1.8
Earth, atmospheric and ocean sciencies	0.0	0.1	2.8	0.0	2.9
Engineering	53.6	0.0	0.0	1.8	55.4
Agricultural sciences	2.7	13.5	0.0	0.0	16.2
Medical sciences	39.8	0.3	0.0		
Other, not elsewhere classified	6.6	0.0	3.3	0.0	9.9

[1] The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities, those that offer a liberal arts program along with other programs such as engineering, business administration, or nursing; and liberal arts colleges, those that primarily award bachelor's degrees and that grant more than half of their degrees in the liberal arts.

NOTE: Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 8 of this report.

SOURCE: *National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F8-7. Expenditures for needed capital projects to repair/renovate science and engineering (S&E) research facilities, as identified in an institutional plan and not in a plan, at nondoctorate-granting institutions,[1] by institution type and field: 1996

[Current dollars in millions]

Field	*Comprehensive universities*		*Liberal arts colleges*		Total
	In a plan	*Not in a plan*	*In a plan*	*Not in a plan*	
Total	$194.8	$93.2	$100.2	$20.0	$408.2
Biological sciences	42.8	28.9	13.2	2.8	
Physical sciences	41.3	19.3	36.6	14.8	112.0
Psychology	4.4	3.0	1.6	0.8	9.8
Social sciences	2.6	0.8	3.4	0.1	6.9
Mathematics	16.5	2.0	17.2	0.3	36.0
Computer sciences	2.7	0.5	0.0	0.6	3.8
Earth, atmospheric and ocean sciencies	62.9	0.0	14.7	0.0	77.6
Engineering	2.9	0.0	13.4	0.0	16.3
Agricultural sciences	0.0	6.4	0.0	0.0	6.4
Medical sciences	0.9	32.2	0.0		
Other, not elsewhere classified	17.8	0.0	0.0	0.5	18.3

[1] The Carnegie Classification of Institutions of Higher Education is used to distinguish between two different groups of nondoctorate-granting institutions: comprehensive universities, those that offer a liberal arts program along with other programs such as engineering, business administration, or nursing; and liberal arts colleges, those that primarily award bachelor's degrees and that grant more than half of their degrees in the liberal arts.

NOTE: Dollar amounts are reported in current dollars, unadjusted for inflation. See Table A-5 in the Technical Notes for the inflation adjustment used in Chapter 8 of this report.

SOURCE: National Science Foundation/SRS, 1996 Survey of Scientific and Engineering Research Facilities at Colleges and Universities.

Table F9-1. Total research net assignable square feet (NASF) of laboratory animal facilities by institution type and control: 1996
[NASF in thousands]

Institution type and control	*Number of institutions*	*Total animal research*	*Animal housing*	*Animal lab*
Total	490	12,213	8,046	4,167
Doctorate-granting	297	11,384	7,660	3,724
Top 100 in research expenditures	97	8,370	5,773	2,598
Other	200	3,014	1,888	1,127
Nondoctorate-granting	192	829	386	443
Public	287	9,476	6,188	3,288
Doctorate-granting	173	8,796	5,886	2,910
Nondoctorate-granting	113	680	302	378
Private	203	2,738	1,858	879
Doctorate-granting	124	2,589	1,774	814
Nondoctorate-granting	79	149	84	65

NOTES: Refers to institutions reporting any space in laboratory animal facilities that are subject to government regulations concerning the humane care and use of laboratory animals. Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

Table F9-2. Government regulation status of laboratory animal facilities by institution type and control: 1996
[Percentage of current laboratory facility research space]

Institution type and control	*Total*	*Fully meets government regulations*	*Needs limited repair/renovation to meet regulations*	*Needs limited repair/renovation to meet regulations*
Total	100%	81%	10%	9%
Doctorate-granting	100	81	10	9
Top 100 in research expenditures	100	80	12	8
Other	100	84	4	12
Nondoctorate-granting	100	92	6	2
Public	100	79	10	11
Doctorate-granting	100	78	11	12
Nondoctorate-granting	100	94	6	1
Private	100	91	7	2
Doctorate-granting	100	91	7	2
Nondoctorate-granting	100	82	9	9

NOTES: Refers to institutions reporting any space in laboratory animal facilities that are subject to government regulations concerning the humane care and use of laboratory animals. Because of rounding, components may not add to totals.

SOURCE: National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.

Table F9-3. Total cost of repair/renovation and construction projects in laboratory animal facilities scheduled for 1996 and 1997 by institution type and control: 1996

Institution type and control	*Construction*			*Repair/Renovation*		
	Number of Institutions	*NASF (in thousands)*	*Cost (in millions)*	*Number of Institutions*	*NASF (in thousands)*	*Cost (in millions)*
Total	71	532	$83.3	31	645	$164.1
Doctorate-granting	63	519	78.9	26	638	162.1
Top 100 in research expenditures	35	313	48.1	20	385	112.8
Other	28	206	30.8	6	253	49.3
Nondoctorate-granting	8	13	4.4	4	7	2.0
Public	25	296	41.7	24	591	146.7
Doctorate-granting	25	296	41.7	21	588	146.1
Nondoctorate-granting	0	0	0.0	3	3	0.6
Private	46	236	41.6	7	54	17.4
Doctorate-granting	38	223	37.2	6	50	16.0
Nondoctorate-granting	8	13	4.4	1	4	1.4

NOTES: Refers to institutions reporting any space in laboratory animal facilities that are subject to government regulations concerning the humane care and use of laboratory animals. Because of rounding, components may not add to totals.

SOURCE: *National Science Foundation/SRS, 1996 Scientific and Engineering Research Facilities at Colleges and Universities.*

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